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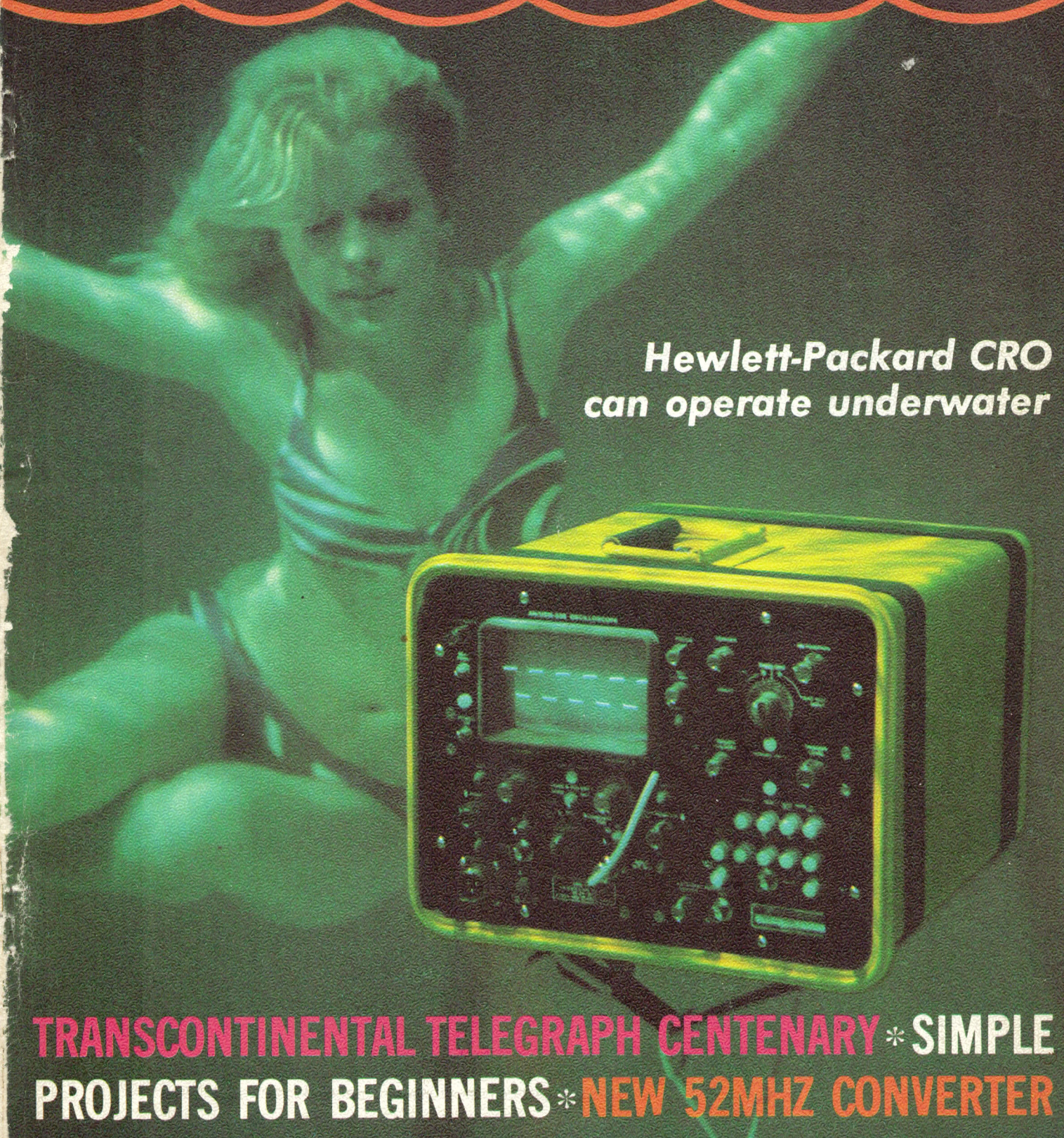

Hewlett-Packard CRO can operate underwater

TRANSCONTINENTAL TELEGRAPH CENTENARY * SIMPLE PROJECTS FOR BEGINNERS * NEW 52MHZ CONVERTER

Registered for posting as a periodical — Category B

Sony's TC-126CS stereo cassette-corder is doubly portable

Here is the latest marvel from Sony — a go anywhere 4-track stereo combination that roams where you roam and plays with unusual quality. Take the entire unit in its smoothly styled carrying case or detach the two separate speakers and slip the TC-126CS unit (with its own built-in speaker) over your shoulder. It's perfect for picnics, at a camp site or to move conveniently around the home. It even plays in your car, plugged into the cigarette lighter socket. And the TC-126CS is also a portable stereo cassette deck to tie in with your amplifier record player rig. In fact, there's a wide variety of input jacks for so many uses and you can record off your 'tranny' if you wish.

It's an uncommonly versatile unit for people who like entertainment wherever they go.

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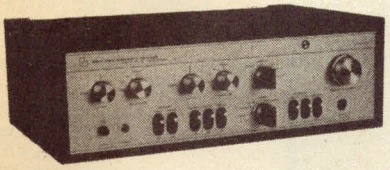
ELECTRONICS Australia

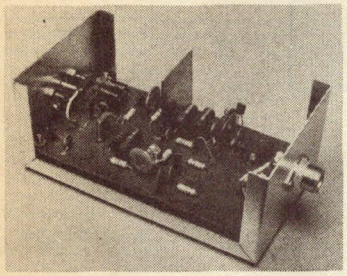
Incorporating "RADIO, TELEVISION and HOBBIES" and "MODERN WORLD"

AUSTRALIA'S LARGEST-SELLING ELECTRONICS & HI-FI MAGAZINE

VOLUME 34, NO 5



LUXMAN SQ505X STEREO AMPLIFIER. This latest addition to the well known Lux range of high quality stereo amplifier is reviewed in this month's Product Reviews and Releases section, on page 102.



52MHz CONVERTER: Our latest converter for use on the amateur frequencies is a solid-state design offering high sensitivity, low noise and full bandwidth at modest cost. Page 26.

On August 22, one hundred years ago, the first message clicked from coast-to-coast across the Overland Telegraph line. Shortly thereafter Australia was linked to Europe and regular world-wide message service began. The story of how Charles Todd and his men pushed a telegraph line through the uncharted heart of Australia begins on page 10.

On the cover

Yes, that oscilloscope really is operating under water! The trace is the calibration signal. We can't imagine why anyone would want to run an oscilloscope under water, but if you need one, Hewlett-Packard can provide it. You have to provide the girl yourself. More information on page 5.

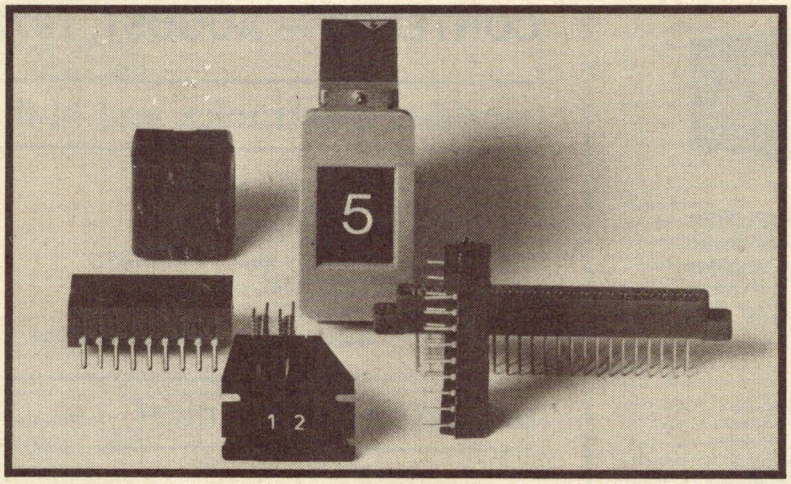
CONTENTS — AUGUST, 1972

world of electronics and hi-fi

projects and technical

regular features

Building a big reputation with small bits and pieces.



Input-Output Devices

Proximity detectors – vane switched oscillators – and thyristor trigger modules to be used in association with the "Norbit" range.

Norbit Static Switches

A new concept in Modular solid state switching for sequential and combinational logic where relays would have been the natural choice.

Printed Wiring Connectors

A comprehensive range of superior quality edge connectors and interconnectors for all contact pitches and board thicknesses. Available in wire wrap or solder termination with a wide variety of mountings.

50-Series Circuit Blocks

Contains uni-directional and bi-directional decade counters with direct display offering a complete range of counting modules.

PHILIPS

Miniature Thumbwheel Switches

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EDITORIAL VIEWPOINT

HiFi is not a passing fad . . . . .

Figures published recently by the RIAA indicate that, during the past twelve months, US citizens spent nearly $500 million on tape recordings. Most were in the form of 8-track cartridges, with cassettes running a strong second. In turn, the figure was dwarfed by the expenditure on disc recordings; this was up by more than 5% from last year, despite price cutting and competition from tape.

There is every reason to be optimistic about the future of the industry involving, as it does, not only tapes and discs but a huge annual expenditure on HiFi hardware — players, loudspeakers, amplifiers and other such devices.

To be sure, current four-channel rivalry is causing some hesitation on the part of buyers but, ultimately, quadraphonic techniques will add a new interest and impetus to the market. I say this because four-channel sound gives further expression to the basic psychological urge in most HiFi enthusiasts to "do their own thing" — by the selection, reproduction and enjoyment of the music that they personally enjoy.

Curiously enough, this basic urge constitutes one of the problems of present-day broadcasting, at least of the more serious kind. The more accessible recorded music becomes (in terms of supply and price) the less inclined are enthusiasts to rely on scheduled broadcasting. Partly as a result, broadcasting has tended to gravitate to a casual entertainment role dominated by news, chatter and pop music. When he wants to listen seriously, the enthusiast reaches for a tape or a disc.

It is interesting to speculate whether this trend could reverse, with an audience "educated" by recordings able to support a better broadcasting service. It is also interesting to speculate on the future of high fidelity music, not broadcast in the usual way, but literally piped into every home by fibre optics. This latter possibility has received a fresh local emphasis with recent mention of work being done in the field by the CSIRO.

Some industry spokesmen have forecast a complete change in home entertainment with the coming of domestic video equipment. They see radio, television and sound taking second place to the colour video player and a library of film epics.

Frankly I doubt it. There is a limit to the amount of drama one can absorb, or other material of a predominantly visual kind. There is a limit to the time one is prepared to spend in front of a viewing screen, subject matter notwithstanding.

My tip is that the most sought-after video cassettes are going to be those with a high musical content. That the most successful equipment format will be the one that provides high fidelity multi-channel sound, at least the equal of what we have today. That way we will be able to enjoy sound as we enjoy it today with the option of looking at the screen now and again to refresh the visual image.

— Neville Williams

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NEWS HIGHLIGHTS

CSIRO fights Bell for "light pipe" patents

The CSIRO's announcement last month, that it is in a worldwide patent battle with American Bell Laboratories over the liquid-filled optical fibre "light pipe", has caused renewed interest in fibre optics in the local electronics industry.

CSIRO scientists believe that, as a telecommunications medium, each of the new-style optical fibres could potentially handle up to 100,000 telephone channels. This means the Post Office could transmit somewhere around a million telephone conversations through an inter-city cable about the same size as those which now carry 4500 to 5000 calls.

Bell Laboratories' liquid core fibres are presumably very similar to the CSIRO's, which are made of fused quartz tubing with a .0015 bore, filled with tetrachlorethylene, a substance more commonly known as dry cleaning fluid.

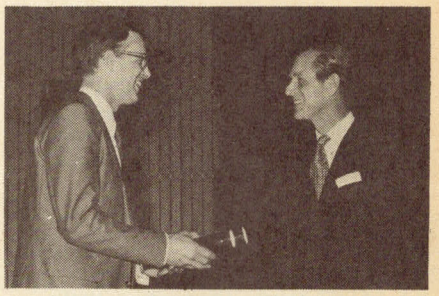
Scientists at Southampton University in the UK, however, have recently announced a clad glass liquid-filled optical fibre which they claim is superior in several ways to both the Bell and the CSIRO fibres. Whether this puts them in the race for patent rights is not yet clear.

The Southhampton fibre has been made with relatively cheap, easily obtainable materials, and is more flexible and more adaptable than those made from specially selected silicas. They claim a transmission loss of only 10dB per km, as compared to 13.5dB per km for the Bell fibre and 17.5dB per km for the CSIRO fibre.

The low-loss region of the Southhampton fibre extends to relatively long wavelengths, as compared to the other two, and at 0.96um where Bell Laboratories report a loss of more than 80dB per km, the Southhampton fibre has a loss of only 14dB per cm. Its loss is claimed to be less than 30dB per km over the wavelength range of 0.8-1.1um.

At the moment the CSIRO believes it has a good chance at securing the patent rights to the basic idea, but it will take up to two years before the matter is decided. Meanwhile the Australian research organisation is negotiating with three firms who are interested in developing the fibres as a commercial product.

Initially there is not much chance optical fibres would be used for long-distance communications. Millimetric wave systems are already well along the path toward practical application, and the fibres would seem to have only marginal advantages over these. Their most impressive use in the near future would probably be in wideband local subscriber networks such as those required for TV phones, data services, cable television, etc.



PLESSEY'S "PRINTSWITCH" won a 1972 Design Council Award, presented to John Ashman of Plessey by the Duke of Edinburgh. "Printswitch" is a rotary switch made by printed circuit techniques.

Plumbicon challenged by new Toshiba tube

TV camera tube makers have for years been trying to develop tubes as good as the Plumbicon without infringing on Philips patents. Toshiba announced recently they have succeeded with a new tube called the "Hi Sensicon".

Toshiba's tube also uses a lead monoxide target, but the method of manufacture is different enough to avoid patent infringement. The "Hi Sensicon" will be made in three versions, for red, green and blue, and will be made in the new 1 inch size as well as the 1¼ inch size. It will directly replace the Plumbicon in existing equipment.

Video phones poised for take-off

After years of experimental work and predictions that video telephone service is "just around the corner," telephone manufacturers finally have video phone hardware in use commercially.

Bell Telephone's PICTUREPHONE service, initiated in Pittsburgh in 1970, is gradually becoming available in other US cities as central telephone offices are modified for video service. PABX switching services for up to 10 video phones are standard equipment, but custom switching has been installed for larger numbers of stations.

Bell Laboratories have announced an 89 line PABX which will not only switch internal intercom video phone calls but will connect individual stations to telephone central offices in each city. The new PABX can also provide access to the company computer to retrieve statistical and graphical information.

In Sweden, video phones made by L. M. Ericsson are undergoing field testing and will be hooked into the public system shortly. An international video phone test was done last December as part of dedication ceremonies at the new satellite ground station at Tanum, Sweden.

The Ericsson equipment was used at both ends of the transatlantic link through Intelsat IV, requiring that a half-ton of equipment be flown to Washington, DC. International standards for video phones are not yet established, so Swedish-American systems could not be directly connected.

The British Post Office is also testing video phone equipment with an 18-station network linking its London offices with its research centre at Dollis Hill, a distance of 18 kilometres.

Initial customers for video phone systems are expected to be medium-to-large companies who can make extensive use of the system internally while the city-wide and inter-city links are being established.

SECRETARIES ON CAMERA demonstrate the new PICTUREPHONE PABX, a video telephone switching centre designed by Bell Laboratories. The switching equipment, installed in another room, can service up to 89 audio / video lines at the customers location.

SIEMENS DIALOG TELEPRINTERS transmit results from the 31 Olympic centres to the computer at Munich.

Multi-lingual team prepares software for Olympic computer

Beginning on the 26th of this month, when around 9000 athletes taking part in 21 sports meet to compete for Olympic gold medals, a Siemens computer system, the largest and the most widely branching ever used on a sporting occasion, will ensure that about 4000 journalists from all over the world, the officials and the millions in front of radio and television sets receive up-to-the-minute news of the results from all of the 31 Olympic centres between Munich and Kiel.

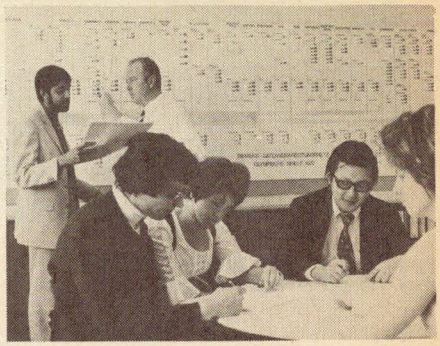
Dialog teleprinters (see picture), connected by transmission lines to a computer centre in the Munich Olympic Stadium, will be installed at these centres. The moment the results of the events are announced by the judges, the information is passed to the computer centre. All the incoming data are stored, sorted and compared and are then made available, partly via teleprinter, to the press, radio, television and officials as quickly as possible in the form of printed lists of results.

An international staff at Siemens has been planning applications for the computer.

Among others, the team includes an Australian, a Belgian, a Chinese, nine Englishmen, five Frenchmen, two Greeks, an Indian, a Jugoslav, three Italians, six Austrians, a Spaniard, a Swiss, five Hungarians and 146 Germans.

In addition to automatically determining the placings of the contestants, the competition results system will also note which athletes have qualified for the next round, represent graphically the pairings for boxing, judo, wrestling and fencing and indicate any new Olympic or world record which may have been set.

Also, information is available on the 15,000 athletes, officials, trainers, team officials and guests of honour who will attend the Games, on all the rules of the 196



AN INTERNATIONAL GROUP of data processing professionals have planned applications for the 1972 Olympics computer, the largest ever used for a sporting event.

Olympic events, on records, victories and latest ranking lists and on the cultural events. A further "pool" contains historical data — information on the first six in every event on the Olympic program since 1896.

The core of the system is constituted by two Model 4004 / 45 data processing systems, to which a total of 72 information stations are connected by way of over 6000km of telephone lines.

The information system is based on a process for the electronic storage and retrieval of information developed by Siemens and known as GOLEM (German abbreviation for randem access storage-oriented inquiry system with list-type organisation). This data bank system has been used successfully in a wide variety of applications. The program system was changed slightly for the special requirements of the Olympic Games and will be used under the modified name GOLYM in Munich.

Autopilot flies Concorde 10 feet off ground

In an unusual program of test flights at Toulouse, just announced by Aerospatiale, the French-assembled Concorde 001 has been repeatedly flown "hands-off" by its autopilot a few feet above the runway surface in order to gather essential aerodynamic data unobtainable in wind tunnels.

Altogether 15 automatic "landings" were made with the autopilot set to level off and hold height, first at 50 feet and then at progressively lower heights down to only ten feet. The runs were automatically maintained for up to two kilometres along the runway.

The performance was made possible by modifications of the autopilot and automatic landing system developed for Concorde by Marconi-Elliott Avionic Systems Limited and its French partner SFENA.

The tests were flown because designers needed to measure precisely the airflow interaction, or ground effect, between the runway surface and Concorde's narrow delta wing. This could only be measured by making runs at preselected heights, using the precision electronic autopilot to fly extremely accurately and to eliminate human piloting reactions from the flight test measurements.

Darling Downs mice cut TV power cables

At the peak of the recent mouse plague in Queensland the voracious mice chewed through 15 high-voltage power cables which supply the Channel 10 transmitter at Mount Mowbullan.

Mr D. G. Pennycuick, one of our readers in Toowoomba, reports that the selective mice attacked only the cables which would put the transmitter out of action — and in fact it was out of action during the night, but station engineers were able to repair the damage just a half hour before Channel 10 was due to begin transmitting.

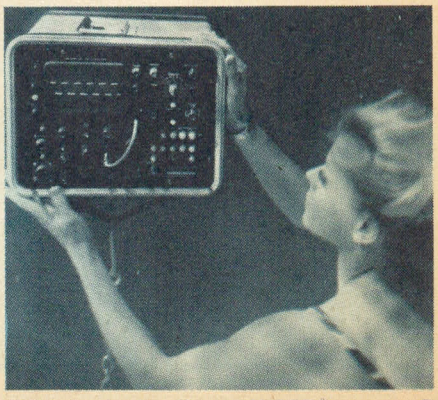
Underwater CRO

Hewlett-Packard's new Model 1700E is able to go beyond the capabilities of earlier ruggedised oscilloscopes, even underwater in a sealed case, because of its low power consumption.

On AC mains power, these models consume less than 25 watts; on DC mains or internal battery pack, they consume only 18 watts. The majority of components operate at only 10 to 20 per cent of their rated power maximum, which assures low heat build-up and favours reliability.

The Model 1700E has the capabilities normally associated with laboratory type instruments: 10 nanosecond rise time, 35MHz response and a 10mV / - division deflection factor. It is a dual channel instrument with time-base capabilities for digital as well as analogue measurements.

In designing the instrument to meet the MIL-STD-108 drip-proof requirement, H-P engineers succeeded in making it completely drip-proof — with front-panel cover removed. Gasketing is used around the front panel and around the cathode-ray tube face. Each push-button is covered by a self-sealing transparent plastic glove on the front panel. External AC / DC power is brought through the front panel so no additional holes need be made in the watertight enclosure. Actually, if dropped in the water, the instrument would float.



Sizzling!

the only word to describe the extraordinary performance of the new Wharfedale "Denton" and "Linton" compact speaker systems.

Building effective compact speaker systems requires technical *"know-how"* and *experience* — and that's where Wharfedale really shines. For over forty years Wharfedale has been Britain's leading manufacturer of high quality wide range loudspeakers; Wharfedale advances in technology are very obvious in the all-new "Denton" and "Linton".

Two models of each unit are available . . . a two way system with an entirely new 8" bass reproducer and a 2" tweeter, and a three way system which specifies a 4" mid-range speaker in addition, to add further reinforcement in the *"presence"* frequencies.

A long throw voice coil is used in the bass speaker to provide restraint-free lower registers and the new 2" tweeter is the result of intensive Wharfedale research — high frequencies are smooth and satisfying. Large magnet structures offer greater sensitivity.

Now examine closely these brief specifications:

DENTON 2.

Size: 14" x 9¾" x 8¾"./Frequency response: 60-16,000 Hz. ± 3 dB./Power rating: 20 watts DIN./Speaker complement: 8" bass speaker, 2" tweeter./Crossover frequency: 1,400 Hz./Finish: Oiled teak or polished walnut.

LINTON 2.

Size: 19" x 10" x 9½"./Frequency response: 55-17,000 Hz. ± 3 dB./Power rating: 20 watts DIN./Speaker complement: 8" bass, 2" tweeter./Crossover frequency: 1,200 Hz./Finish: Oiled teak or polished walnut.

LINTON 3.

Size: 19" x 10" x 9½"./Frequency response: 55-17,000 Hz. ± 3 dB./Power rating: 25 watts DIN:/Speaker complement: 8" bass, 4" mid-range, 2" tweeter./Crossover frequencies: 1,100 and 4,000 Hz./Finish: Oiled teak or polished walnut.

DENTON 3.

Size: 14" x 9¾" x 8¾"./Frequency response: 65-17,000 Hz. ± 3 dB./Power rating: 25 watts DIN./Speaker complement: 8" bass, 4" mid-range, 2" tweeter./Crossover frequencies: 1,100 and 4,000 Hz./Finish: Oiled teak or polished walnut.

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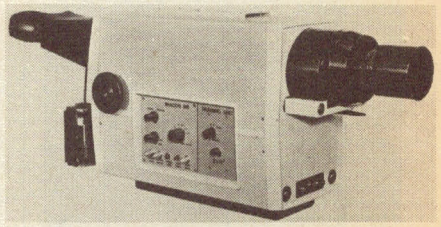
NEWS HIGHLIGHTS

Colour video projection for the home

Sony Corporation will market a colour video projection system for consumer use later this year. Based on a highly efficient Trinitron tube, the system will project a 50in (diagonal) picture from 5ft away. The first models, designed for the 525-line NTSC system, are expected to sell for about $2000 as compared to $70,000 to $200,000 for types used commercially.

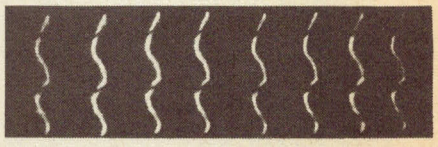
POLLUTION DETECTOR. This instrument is so accurate it can determine from which of the world's oilfields a spilled oil slick came and thus determine which ship was carrying it. Known as the Unicam SP 1900 Atomic Absorption Spectrophotometer, the instrument can detect metals at levels of one part in tens of millions or better. No especially high training is required to operate it. Pye Unicam Ltd, Cambridge, UK.



600M frames per second

An ultra high-speed image-converter camera, capable of recording sequences of up to 50 pictures at speeds up to 600 million frames per second in the multiple-frame mode, and at streak rates of up to 50mm per nanosecond (ie, with a resolution time of 5 picoseconds) has been announced in the UK.

The Imacon 600 is a self-contained unit which has the ability to start recording pictures very quickly from a low-power command signal. Thus, instead of the event being triggered by the camera, the camera can be triggered by the event. It is intended to meet the picosecond time-resolution requirements of present day laser research. The illustration shows the development of plasma in a Xenon flash tube at 600 million frames per second.



The camera can be plugged into ordinary power outlets and consumes less than 50 watts. Exposure time is controlled by applying electrical signals to beam-deflection plates in the image converter tube, causing the beam to be deflected up and down across a slit. In the multiple-frame mode, sine waves of various frequencies are used; ramp waveforms are used in the streak mode. The range of speeds in both cases is provided by plug-in modules, so that all the electronic and power supply circuits are contained within the camera body. (John Hedland Ltd, Newhouse Laboratories, Bovingdon, Herts.)

Sydney Tech graduates ready for colour

Among the Australians most anxious to have colour television introduced in Australia is one of our staff members and 49 other men who have graduated from a colour TV receiver servicing course at Sydney Technical College.

The course, the only one of its type in Australia, began early in 1970 when many young people thought we would be getting colour TV in only a year or so.

The 36-week course of night study at the college and work at home covers the entire field of the PAL colour TV system. The PAL system, to be used in Australia, is the system operating in Britain and much of Europe.

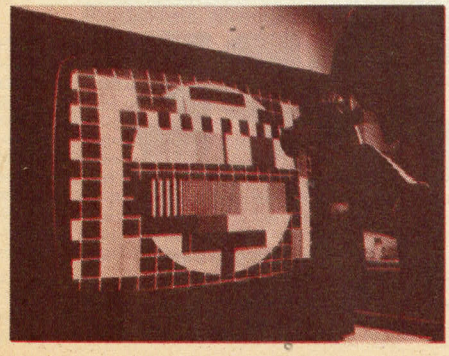
The key item of equipment is a rack of Philips colour television test equipment consisting of sync pulse, colour pattern and sub carrier generators, a PAL colour encoder, an IF modulator, VHF converters. This set-up will transmit three basic multi-coloured test patterns to several receivers. Each pattern has scores of variations.

The third course at the college begins in February.

All the students are television and radio servicemen who have previously completed a NSW Department of Technical Education course in servicing black and white television receivers.

Before embarking on the colour television service course, they have completed at least 1,200 hours in radio and black and white television receiver servicing.

The syllabus begins with a study of colour fundamentals and the human eye. Students progress through theoretical and practical laboratory studies of three-gun colour picture tubes, deflection and convergence circuitry, DC power supplies, static convergence, dynamic convergence, chrominance, colour burst amplifier and automatic phase control, colour demodulators, drive and matrixing.



Sydney Technical College teacher Mr Brian Griffin examines the phosphor dots on a Philips colour television screen.

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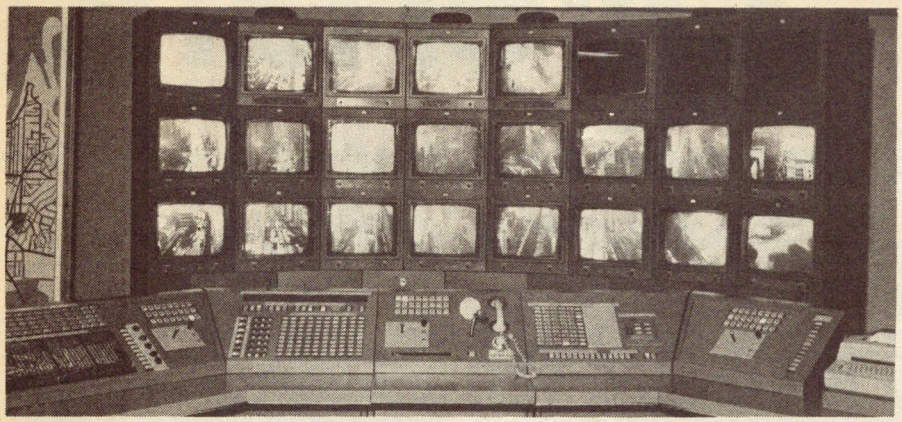
NEWS HIGHLIGHTS



The NSW Department of Government Transport has entered the first phase of a project to computerise the traffic lights in Sydney. A pilot program has been completed and eighty intersections will be connected to the department's new Digital PDP-11/20 computer by June of next year. The new control system, which will be located at the Traffic Control Centre on Brisbane Street (pictured above), will eventually control the traffic lights from Edgecliff to Drummoyne, about 160 intersections in all.

Besides the obvious advantage of programmed responses to changes in traffic density, the computerised lights cost about $700, as compared to about $1500 for the electromechanical equipment now used at each intersection. Regional computer control networks are expected to be built in the future.

1972 Faraday lecture

"Telecommunications — The Nerve System of Modern Society" is the title of the 1972 Faraday lectures to be presented by Mr A. H. Kaye, Assistant Director of Engineering, Australian Post Office, South Australia. The lectures this year coincide with the 100th anniversary of the Overland Telegraph line, described elsewhere in this issue.

Following a tradition set by Faraday himself, the 90-minute lectures make extensive use of visual aids, such as a unique multi-projector, and stress simple explanations of complex subjects.

The lecture is aimed at 6th year secondary school students, technical college students, members of learned institutions and all interested citizens. It will be presented about 50 times with morning, after and evening presentations in all capital cities and a number of smaller cities.

The whole field of telecommunications will be covered: radio broadcasting, television, satellite services, navigational aids, data transmission and aids to essential services.

The first lecture will be in Adelaide on Wednesday 23 August and the last in Perth on Wednesday 11 November. Tickets are available free from local offices of the Institution of Radio and Electronics Engineers. Tickets for the first four lectures can be obtained from the following addresses.

For Adelaide, 23 August: Hon Secretary; N. Sawyer, Box 597E, GPO, Adelaide 5001. For Melbourne on 5 and 6 September: IREE Division Offfice, 191 Royal Pde, Parkville 3052. For Bendigo on 8 September, write to Parkville address.

Dates and ticket addresses for succeeding lectures will be listed in the next issue.

1973 IREE convention

The 14th National Convention of the IREE will be held at the Exhibition Building in Melbourne on August 20 through August 24, 1973.

Flat computer terminal display —2 inches thick and portable

A flat display panel has been announced by Burroughs to replace the CRT in computer terminals. The 14.5 x 9.4 x 2.2 inch picture-frame style display weighs only 7.5 pounds, making it easily transportable in an office.

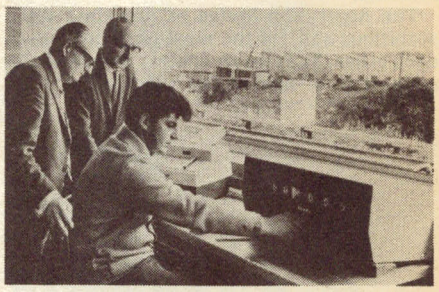
Designated the TD700 Self-Scan Terminal, the system is claimed to be the first commercially viable product to use the gas discharge matrix technique. Individual gas-filled cells in a honeycomb configuration are selectively ionised and illuminated to display the various characters.

The character size is 0.20 x 0.28 inches high and is built on a 7 x 5 dot matrix. One reason the system is now feasible is that Burroughs has eliminated about 90 per cent of the addressing electronics which was necessary with earlier design attempts. They have developed production techniques at their Plainfield, NJ plant which will enable them to make units that will sell in the same price range as CRT displays. Burroughs is offering Self-Scan rights to other manufacturers.

PAL licensing policy reversed

AEG-Telefunken, the West German developer of the PAL colour TV transmission system, has begun to license Japanese companies to build PAL receivers for export to Europe and other areas using PAL. Previously licences had been issued, with the exception of Hitachi, only to manufacturers in countries which used the PAL system.

The policy reversal closely followed an announcement by Victor Company of Japan that they had worked out a PAL-type colour TV receiving system which did not infringe on the Telefunken patents. Victor's new system, named "Deluxe PAL", will be on sale in Europe before the Munich Olympics start this month. The company claims it gives better performance than the sets made by Telefunken techniques.



Victorian Railways has installed an Avery weighing-in-motion system to cut delays in weighing outgoing freight at its South Dynan Goods Yard, Melbourne. An electronic system with digital readout, it instantly weighs coupled waggons as they pass at up to 5mph.

SIMON GRAY PTY LTD, well known to our readers as an electronics and hi-fi distributor, has merged with Swift and Bleakley, a major distributor of camera and cine equipment. Heading the new company will be Mr Wulf Gray, Chairman, Mr John Bleakley, Managing Director, and Mr John Mitchell, General Manager. The Bleakley Gray Corporation will distribute a wide variety of photographic, TV, broadcast, audio/hi-fi and business equipment.

Overland

In a dramatic and nearly fatal ceremony just a hundred years ago this month, Robert Patterson made the final connection in Australia's first transcontinental telegraph line, a 2000 mile single-wire line between Adelaide and Darwin. From Darwin to Java an underwater cable had been laid, meaning that news of the world could be known as it happened.

Following the invention of the so-called electric telegraph by Samuel Morse in the USA in the 1840s, there was rapid development all over the world in this new form of instant communication.

Defence leaders, the business world and the press were quick to see its advantages.

Australia had its first telegraph in 1854 with a line between Melbourne and Williamstown (Victoria). It was soon extended to other centres, notably on the coast and to the goldfields.

By the time the overland telegraph project was undertaken, all States except Western Australia were linked telegraphically.

In the meantime, submarine cables were snaking around the world, linking countries and continents. There were various proposals from overseas to bring a cable to Australia to integrate into the colonial systems.

The Australian States at this time were ambitious and, for the most part, jealous of each other. They were acutely aware of the advantage of having the submarine cable terminating in their territory — and of obtaining the revenue from all ongoing telegraph traffic.

South Australia already had this advantage. Because Adelaide was the first port of call on the inter-State telegraph for ships from overseas, there was always a congregation of news men there to obtain news and telegraph it to their papers in the eastern States. The race to be first on the line led sometimes to pages of the Bible being lodged for transmission so that a reporter could have exclusive use of the line while writing his stories.

The political rivalry between the States to obtain the overseas terminal led to various proposals for building overland lines terminating on the northern or western coasts of Australia. It also led to intense interest in the comings and goings of the explorers.

The keenest rivalry was between Queensland (supported by NSW) and South Australia. There was also a proposal to terminate the cable on the Western Australian coast and to build an east-west line.

South Australia, proposing to build a north-south line to Darwin, had two trump cards. One was that explorer John McDouall Stuart had shown that a route was possible. The other was the stature of Charles Todd in the telegraph world.

Born on July 7, 1826, Charles Todd entered the service of Greenwich Observatory in 1841 at the age of 15. Six years later, he was appointed assistant astronomer at Cambridge Observatory. He returned to Greenwich in 1854 and was placed in charge of the laboratory for research into electric telegraphy.

In the following year, he accepted an appointment to Adelaide as government astronomer and superintendent of telegraphs. The addition of the postal department to his responsibilities came later, just before the overland telegraph project began.

His first job after arrival was to build the telegraph line from Adelaide to Port Adelaide.

In June 1870, the South Australian Government signed a contract with the British Australian Telegraph Company. The Company undertook to extend its cable from Java to Darwin if the South Australian Government would provide a line down to Adelaide. The contract stipulated that the line had to be ready for operation by January 1, 1872.

The government immediately voted £120,000 ($240,000) for the project. Todd was appointed to take charge. "Then, perhaps for the first time," he said, "I fully realised the vastness of the undertaking I had pledged myself to carry out."

Huge quantities of supplies from Britain and Germany had to be ordered. With 20 posts to a mile and 1800 miles to cover, Todd needed 36,000 insulators and wrought iron insulator pins. More than 2000 miles of 8 gauge galvanised single-strand wire was needed, including wire for the lightning conductors which had to be installed on every second pole.

Also, the nine intermediate stations along the route needed equipment, instruments and batteries, and the terminals at Port Darwin and Port Augusta had to be completely outfitted.

The stations each contained batteries capable of developing 120 volts. Batteries were of the "Meidinger cell" type, which had zinc and lead plates with a sulphate of magnesia solution and copper sulphate crystals in an inverted "balloon" jar. The closed circuit hand Morse method of transmission was used.

Realising that he had a battle against time, Todd divided the construction into three sections — southern, centre and northern.

The southern and northern sections were let to private contractors — Edward Meade Bagot in the south (Port Augusta, which was already connected telegraphically to Adelaide, to the Macumba River, near Oodnadatta); and Joseph Darwent and William Dalwood in the north (Darwin to Tennant Creek).

The centre section, which it was assumed would be the most difficult, was undertaken by government parties.

As little was known of the harsh, arid interior (McDouall Stuart had not done a complete survey), explorer John Ross went in advance of the construction parties to select the best route.

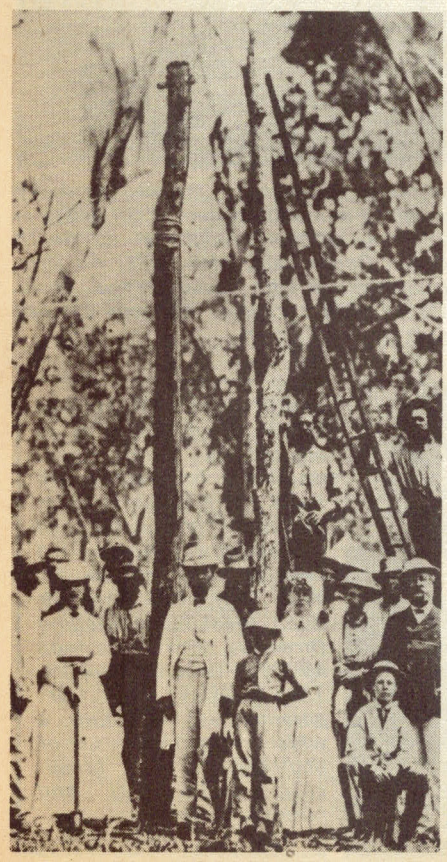
Todd divided the centre section into five parts, which he called A, B, C, D and E.

The five leaders were all capable and experienced bushmen. They were Richard Knuckey (A), Gilbert McMinn (B), James Beckwith (C), Alfred Woods (D) and William Harvey (E). Woods was made leader-in-charge.

Beckwith became ill before reaching his starting-point and had to return to Adelaide. His place as leader was taken by William Mills.

Party A had 800 miles to travel from Adelaide before they started work. Party E had 1,300 miles, a journey which took eight months.

The instructions for all parties were detailed, clear and comprehensive. They covered such items as the type of wood to



PLANTING THE FIRST POLE, Darwin, September 15, 1870. Harriet Douglas (daughter of the Government Resident), who tramped down the soil during the ceremony, is standing to the left of the pole with a mallet in her hand.

TELEGRAPH PIONEERS. Overland Telegraph officers (left to right) Little, Patterson, Todd and Mitchell pose next to a supply waggon near the Roper River. Patterson resented Todd's presence in the north and threatened to resign if Todd interfered.

Telegraph

select for poles, the size of poles, job organisation for wiring, building specifications for repeater stations, sinking of wells, stores accounting, water conservation, discipline, morale, and food rationing details per man per day.

It was largely because so much detail was provided for in the instructions and because the organisation was so thorough that the centre operation was carried out so efficiently. The calibre of the men was another contributing factor.

The five parties working on the centre section totalled 100 men. They had 15 horse wagons, 18 bullock wagons and 5 buggies, using 165 horses and 210 bullocks in the teams, in addition to pack-horses and riding horses, A string of 80 camels was also hired to transport supplies.

The centre section was finished on schedule.

Bagot carried out his assignment in the south efficiently and had no difficulty in completing it within the given time.

It was in the north that trouble occurred.

Darwent and Dalwood started off well enough, with 89 miles of line up in 54 days. Then came the wet season. Work continued none the less, and the line had reached the Katherine River, 200 miles south of Darwin, by the end of January 1871.

Conditions deteriorated. Floods cut off supplies. Horses were bogged and drowned. Food went bad. Some men, understandably, refused to work.

So the government overseer stepped in and sacked the contractors. They all then sailed back to Adelaide.

This was May 3, 1871. It was July 5 when they arrived back in Adelaide. There were less than six months to meet the terms of the BAT contract, which included a penalty clause for late completion.

In great haste a new expedition, a government one this time, was organised in Adelaide. The leader was Robert Patterson, a 27-year-old engineer, and second in charge was Walter Rutt, another engineer. A party of 200 men was quickly recruited and embarked in five ships for the north. They had with them 170 light horses and 500 working bullocks. They left Adelaide on July 27 and arrived at Darwin on August 24.

Patterson was offered, in addition to his salary, an incentive payment scheme which included a $600 lump sum at the start and a declining bonus based on the date of completion of the line: $3000 if done by December 3, $2000 by January 15, $1200 by February 1 and $600 by March 1.

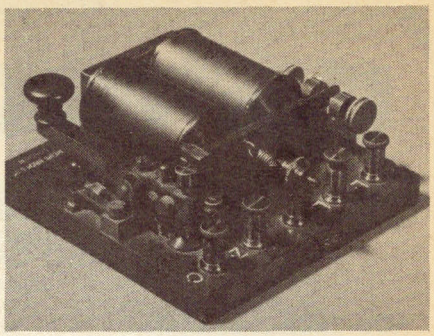
Patterson, and Todd too, advocated taking the ships up the Roper River so that supplies could be landed closer to the point reached (the King River) by Darwent and Dalwood.

The government intervened, however, and instructed that the ships should go to Darwin. This meant that Patterson had to go over the same ground as Darwent and Dalwood, using up valuable dry months to get to the point where he could resume poling.

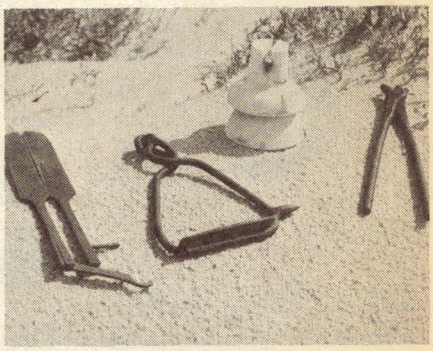
He met with difficulties right from the start. Many animals had died during the voyage, and the rest were in poor condition and could not survive the journey south in the hot, dry conditions.

By the time he reached the point where work could be resumed, the next wet season had arrived. No progress had been made during the dry season. And time for the contract was running out.

Supplies for the men were running out too. Sickness was rife in the camps.



TELEGRAPH KEY of the type used by Todd to send messages over the Overland Telegraph line during and after its construction.



CONSTRUCTION RELICS have been preserved in the Adelaide Post Office Museum. They are, from left to right, a wire clamp, a tree or pole climbing stirrup, a double umbrella insulator and a wire cutter.

An urgent message was sent to Adelaide for fresh supplies. Todd went north with them.

At the end of 1871, when the time allowed by the contract expired, there were still 394 miles of line between the King River and Tennant Creek to be completed.

Todd had arranged for men from the centre parties to continue poling further north, and, as the gap between the two ends lessened, a pony express was organised to carry messages from one to the other. That was actually how the first through messages were sent.

But it did not last long. On June 24, the South Australian Government had its first piece of luck. The Java-to-Darwin cable broke.

No more was heard from British Australian Telegraph about the penalty clause which had been costing the government $200 a day. Now the BAT was in trouble and began grappling up the cable to check it — a job which was not to be successful until after Patterson had completed the telegraph line.

Encouraged by the cable failure, work on the line resumed with new vigour. By the night of August 21, eight miles of wire remained to be strung for completion of the line. Parties worked by moonlight, and by 9 am on August 22 they reported to Patterson that they expected to have the line connected by noon that day.

The actual final join was made near Lawson Creek, about 60 miles south of Frews Ponds, but Patterson wanted to have a ceremonial joining of the two ends near his depot camp at Frews Ponds, so he had

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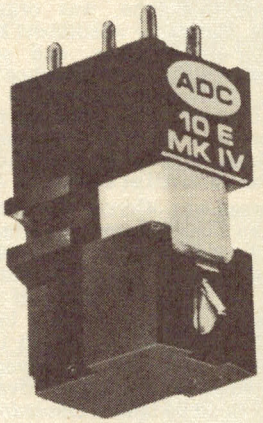

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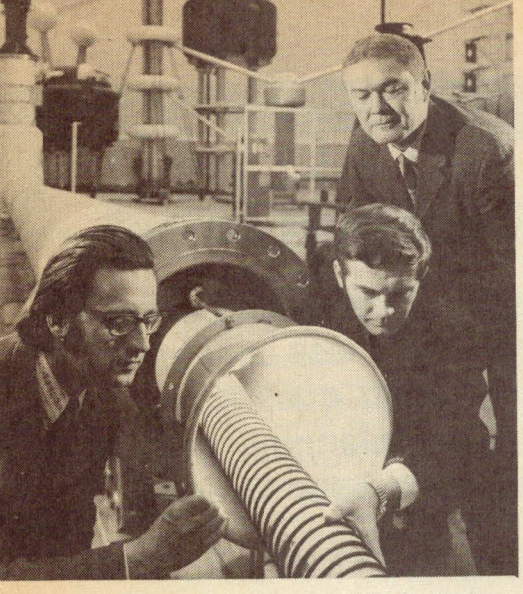
E207

SUPERCOLD POWER CABLE



An aluminium power cable — chilled to a supercold 320°F (160°C) below zero — has successfully withstood up to 435,000 volts during experiments conducted by engineers from the General Electric Research and Development Centre at Schenectady, New York.

In the first tests of cryogenic (very low temperature) transmission at commercial electric power system ratings, GE's 40-foot-long cable was subjected to voltages comparable to those now handled by present day, high voltage, commercial underground power lines. The sustained testing lasted several days.

The dramatic experiments climaxed a three-year project to explore the feasibility of using supercold cables — underground and out of sight — to transmit huge blocks of power into congested urban areas.

A cryogenic cable system would take advantage of the lowered resistivity of metal conductors at low temperature. Such systems — 20 to 40 miles long — could carry power underground from the outer edge of the suburbs into the heart of a city.

Success of the GE tests indicates that electric power transmitted by a cryogenic cable system could exceed 3,500 million-volt-amperes (MVA). By contrast, a 500 MVA rating would be considered high for transmission cables now serving metropolitan areas.

"While the world's cities are demanding increasing amounts of electric power with each passing year, the amount of above-ground space available for high voltage transmission lines is becoming almost non-existent," said Dr Arthur M. Bueche, GE vice president for research and development. "The ability of supercooled cable systems to transmit extremely large amounts of power — undergound — through a restricted space may be the solution to this increasingly serious problem."

"Conventional underground transmission lines — which use oil-filled cable — already are in use over short distances in some urban areas, but have a much lower capacity than that offered by cryogenic cable systems," the GE executive pointed out.

The tremendous capacity of cryogenic cable systems would find initial applications in America's ten largest cities. With the soaring demand for electricity, however, they eventually could be called upon to feed power into most US cities over 500,000 population.

Dr Bueche emphasised that costs of transmitting power underground, including cryogenic cable systems, will continue to be many times greater than the costs of transmitting power by above-ground methods.

Although the GE tests have proved the basic feasiblity of underground cryogenic transmission at power system voltages of 345,000 to 500,000 volts, additional research will be needed to identify the most effective type of electrical insulation, Dr Bueche said.

The initial three-year project involved intensive research into the performance of conductors, electrical insulation, and refrigerants (liquid nitrogen, hydrogen, or helium) for a cryogenic cable system.

For safety and economic reasons, the researchers selected liquid nitrogen as a coolant for the cable. Unlike liquid hydrogen, nitrogen is non-flammable. In addition, liquid nitrogen (320°F below zero) is not as cold as liquid helium (450°F below zero), and thus requires much less expensive refrigeration equipment.

Economy also was the reason for selecting aluminium over copper as the conductor. At the supercold temperatures of liquid nitrogen, both aluminium and copper conduct electricity ten times better than at room temperature. However, aluminium is three times lighter than copper and much less costly.

For electrical insulation, the GE researchers chose a one-inch-wide, spun-bonded, polyethylene fibre paper over several other materials tested. The paper is similar to materials sold commercially for use in gift wrapping, wallpaper, and paper coats or smocks.

The GE researchers say the reliability of a cryogenic cable system would be at least comparable to conventional oil-filled underground cable systems. The power cables would be protected by a rigid pipe, and even if a malfunction occurred in the refrigeration or pumping equipment, the supercold temperature would be maintained long enough for repairs to be made.

It appears that ten or more years of additional research will be needed before a commercial cryogenic cable system can become operational.

Photo shows, left to right, Dr Brian C. Belanger, Dr Michael J. Jefferies and Stephen H. Minnich examining the cryogenic cable following several days of sutained testing.

Telegraph, cont.

previously cut the wire at that point. Contact was made with Adelaide and Port Darwin and the South Australian Chief Secretary, in the absence of the Governor, agreed to hold the ceremonial join at 3pm on August 22.

According to Patterson's diary, the event could well have been his last official ceremony:

"Half the party seized hold of me and of the wire, and the other half the other end, and stretched with might and main to bring the two ends together.

"All our force could not do this. I then attached some binding wire to one end. The moment I brought it to the other end the current passed through my body from all the batteries on the line.

"I had to yell and let go. Next time I proceeded more cautiously, and used my handkerchief to seize the wire with. In about five minutes I had the joint made complete, and Adelaide was in communication with Port Darwin. It would have been with England had the cable not broken down.

"We then drank success to the overland telegraph, and fired off 21 rounds from our revolvers, and immediately adjourned to Frew's Ponds."

Selflessly, Charles Todd did not participate in the ceremony, having made a full inspection of the newly built parts of the line since leaving Patterson in the north. From a point about 400 miles south of the join, he received congratulations over the new telegraph system:

"When the wires were joined, I was at Central Mount Stuart. In the evening I was inundated with kindly worded messages from friends in all parts of the Colonies. It was a bitterly cold night, as, seated on the ground with a little pocket relay instrument, I received one after another of these friendly recognitions. I transmitted my replies until I was nearly frozen and completely knocked up with fatigue and excitement.

"Communication was established right through, betwen Adelaide and Port Darwin, a distance of nearly 2000 miles. Thus the great work, notwithstanding all our mishaps and disasters, was successfully accomplished within two years.

"I may with confidence assert that no line passing through a similar extent of uninhabited country, where the materials had to be carted over such long distances, no line of equal length and presenting similar natural obstacles, has been constructed in the same short space of time."

The final cost was $958,350 (four times Todd's original estimate), which included the building of repeater stations. They were (in order south from Darwin) at Yam Creek, Katherine, Daly Waters, Powell Creek, Tennant Creek, Barrow Creek, Alice Springs, Charlotte Waters, The Peake, Strangways Springs and Beltana.

Only five men died during the construction of the line — one from thirst, one lost looking for horses, one drowned, and the other two from sickness. This, in view of the mammoth job and the difficult country, is a remarkable record and an indication of the thoroughness and efficiency with which the whole project was carried out.

Japanese industry

Worldwide economic problems have spurred Japanese electronics industries to move away from transistor radios and TV sets into less consumer-oriented products. In future they will concentrate on high quality, higher priced equipment where their unparalleled long range planning policies will make them world leaders. An on-the-spot report from Gene Gregory.

After a phenomenal growth of ten times in ten years, the Japanese electronics industry has entered the choppy waters of transition. Added to rising wages and market saturation for industry product leaders at home, and increasing competition from developing countries of Asia at home and abroad, Japanese manufacturers have now encountered a succession of problems in the US market where sales account for over 50% of the nation's total exports of electronic products.

As a result, the bonanza in consumer electronics production began tapering off sooner than had been expected. Reorganisation of the industry, which would have been necessary sooner or later, began in 1971 after the coup de grace delivered by Mr Nixon in his moves to force a revaluation of the yen. And, for the industry as a whole, the shift to higher value-added manufacture of industrial electronics products gained added momentum.

The production value of Japan's electronics industry had climbed beyond the $10 billion (US) mark by 1971, after increasing annually by more than 30% every year since 1966. Behind this continuous high rate of growth there were several favorable demand factors.

The sustained business boom had combined with the growing shortage of manpower, particularly of young workers needed by the electronics industry, to push wages up by 15-18% a year. Personal consumption thus remained vigorous and the demand for general consumer electronic equipment such as colour TV, stereo and tape-recorders was at a high level. Indeed, sales of colour TV in Japan kept abreast of sales from all sources on the affluent American market where there were twice as many consumers, reaching five million by 1971.

At the same time, the shortage of manpower and rise in wages spurred investments in labour-saving equipment. Clerical work was rationalised by adopting electronic calculators, accounting machines, computers and other office equipment. Progress in automation, production control systems and inventory control systems was accelerated.

Strong domestic demand for both consumer and industrial electronic products was supplemented by steady expansion of exports during most of this period. But as 1969 drew to a close, the industry began to feel the effects of the recession in the US market.

In 1970 American efforts to restrict imports of electronic products from Japan moved into high gear. Irritating the American competitors was the fact that Japanese colour TV exports to the US market more than tripled in only four years — from 330,000 sets in 1967 to more than 1.2 million in 1970. After the US Treasury Department suspended tariff exemptions on Japanese-made television receivers, however, exports dropped sharply, hitting hardest at the medium sized firms producing price-competitive buyers-brand sets.

Things turned from bad to worse when the revelation of the price composition for TV sets, in a move to deny the dumping allegations from the US, produced an adverse effect on the home market. Housewives and consumer organisations, angered when they learned that they were paying higher prices than those charged in the US, launched movements to boycott purchase of colour TV sets for a one-year period.

So effective did the boycott prove that over one million colour sets piled up in warehouses, and the major manufacturers were forced to slice production runs by nearly 40%. These cutbacks were the more painful since they came at a time when many companies, such as Hitachi, had just finished the expensive job of tooling up to meet what seemed like a never-ending demand for high-profit colour sets.

As if the TV makers did not have enough woes, the boycott coincided with a phasing out of black-and-white TV production in the face of competition from Taiwan, South Korea and Hong Kong along with a slowdown of the Japanese economy that was already squeezing corporate profits. Toshiba's net income dropped by 30%, and Matsushita, traditionally at the top of Japan's profit-earners, saw their earnings slip nearly 6%.

Sanyo, the traditional indicator of the nation's consumer electronics industry, responded to these reverses with retrenchment and reorganisation — action which has since been followed by other firms in the industry. To ease the pressure, Sanyo cut new plant and equipment investments by about $15 million and reduced hirings from 3,300 to 2,000 new employees in the fiscal year ending March 31, 1971. This followed a December 1970 reduction in colour TV output to 45,000 sets a month from 70,000. Then Osaka headquarters announced that colour TV prices would be cut 17%, a move designed to appease consumers whose crushingly effective boycott had left the company with a hefty backlog.

After a shuffle of top management which brought Kaoru Iue to the presidency, the company took steps to strengthen its position at home and abroad, particularly in the US and Europe. Previously, Sanyo had shipped mostly to private labellers in the US, principally Sears-Roebuck & Co. Now the company is selling under its own name to establish the kind of brand strength that has served Sony and Matsushita so well in export markets. In addition, Sanyo has broadened its overseas sales to include tape and video recorders, as well as colour TV.

Since television had been the central propellant force in the Japanese consumer-

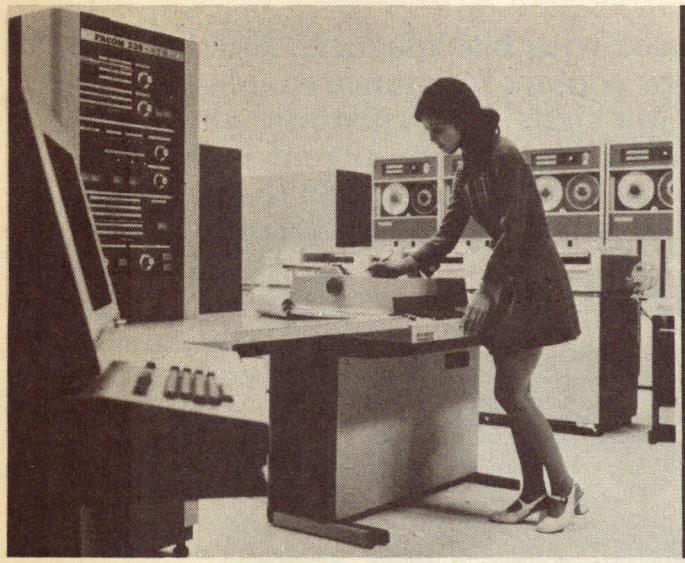
WORLD STATUS OF JAPANESE ELECTRONICS INDUSTRY (1970)
(millions of dollars)

	consumer	industrial	parts	total
USA	3,940	19,683	5,506	28,679
Japan	4,072	2,883	2,486	9,441
W. Germany	759	1,778	886	3,469
UK	423	1,169	620	2,212
France	410	1,150	506	2,066
Italy	227	606	245	1,078

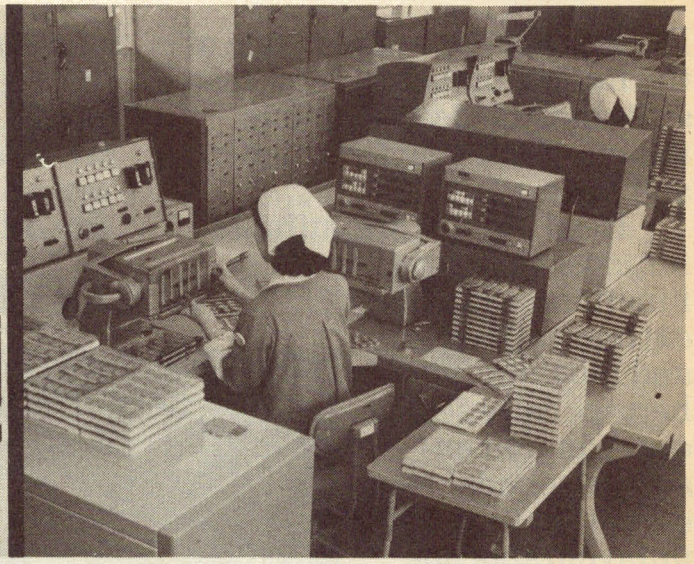
JAPANESE TV INDUSTRY 1965-1975
(Millions of sets)

	1965	1966	1967	1968	1969	1970	1973	1975
B & W TV								
Production	3.8	5.0	5.8	6.6	7.0	7.3	8.3	8.3
Exports	1.3	1.8	1.9	2.7	3.6	3.7	4.5	4.8
Consumption	2.5	3.2	3.9	3.9	3.4	3.6	3.8	3.5
Colour TV								
Production	0.4	0.6	1.20	2.60	4.84	5.85	7.5	8.0
Exports	0.1	0.3	0.34	0.77	1.00	0.80	1.5	2.0
Consumption	0.3	0.3	0.86	1.83	3.84	5.05	6.0	6.0

gears for the future



COMPUTERS AND AUTOMATION are two of the areas into which the Japanese electronics industry is moving. FACOM computers (photo at left) went on sale in Australia last month.



Automated watch testing station at Seiko (right) tests accuracy of watches 10 at a time. IC watches promise to be a major new product in the near future.

oriented electronics industry, the main concern of all of the 12 top TV makers has been to find other products which will take the place of colour TV sets. Industry circles were confident that electronic cookers would serve as a partial stopgap, until the full-scale advent of video tape recorders (VTRs), and that sales would climb to approximately 1 million units in 1971.

Sales, however, dropped sharply as a result of the furore caused by alleged microwave leakage in the spring of 1970. Manufacturers have attempted a comeback by putting out new electronic ranges conforming to more rigid standards, but shipments in 1970 amounted only to around 300,000 units, or a fraction of the figure originally anticipated.

While Japanese exporters have turned their attention to other markets that offer greater growth potential than the American, it has become increasingly apparent that this is, at best, only a partial answer. The industry is in for a painful period of transition to greater emphasis on industrial products and a whole range of data and telecommunications terminal equipment for home and office.

According to a recent Arthur D. Little survey, total sales of the world consumer electronics industry is expected to climb from $10 to $20 billion during the 1970-75 period, or an average of 15% per annum. While the Japanese industry can be counted on to do better than average, with output in 1970 already accounting for some $4.3 billion in consumer electronics products, this sector of the industry is not likely to be able to be the spearhead of a high rate of growth for the industry in the future that it has in the past.

Quite clearly, Japan is not destined to remain a nation of transistor radio or TV set makers. With the shift of an increasing percentage of labour-intensive standard consumer electronics production to the developing countries of Asia, Japanese manufacturers will be forced in the future to concentrate production at the higher-quality, higher-price end of the spectrum, or in those fields where innovation assures them of a market advantage.

This hardly comes as a surprise to the industry. On the contrary, Japanese electronics manufacturers have read the handwriting on the wall and decided that the only defence is a good offensive. Japan's share in the total US imports of transistor radios, for example, began the descent from a 77% peak in 1964 when it began losing steadily to Hong Kong and Taiwan. By 1965, Hong Kong had already largely outstripped Japan as a supplier of electronic components to the US market.

In more recent years, Japanese products, while buffeted by the products of developing nations in the American market, have also begun to meet competition of imports from these nations in the domestic market. In particular, Japan has been largely affected by the mass production of ICs at American-built factories in southeast Asian countries. And, since preferential duties for developing countries were officially decided on at the 1970 UNCTAD conference, added to the increasing import liberalisation, it has become clear that the Japanese industry is in for more of this kind of competition in the home market.

Determined to meet that competition and hold their position in foreign markets, since

FORECASTING THE PRODUCTION OF JAPANESE ELECTRONICS INDUSTRY (1973)
(million of dollars)

	1970	1973 (est)	Annual Growth Rate
Consumer Electronics	$4,074 (43%)	$5,222 (40%)	8.6%
Industrial Electronics	$2,883 (31%)	$4,444 (34%)	15.5%
Electronic Components	$2,485 (26%)	$3,472 (26%)	11.9%
Total	$9,442 (100%)	$13,138 (100%)	11.6%

FORECASTING THE EXPORTS OF JAPANESE ELECTRONICS INDUSTRY (1973)
(million of dollars)

	1970	1973 (est)	Annual Growth Rate
Consumer Electronics	$1,597 (67%)	$2,639 (65%)	18.2%
Industrial Electronics	$ 388 (16%)	$ 944 (23%)	35.0%
Electronic Components	$ 418 (17%)	$ 500 (12%)	6.3%
Total	$2,403 (100%)	$4,083 (100%)	19.4%

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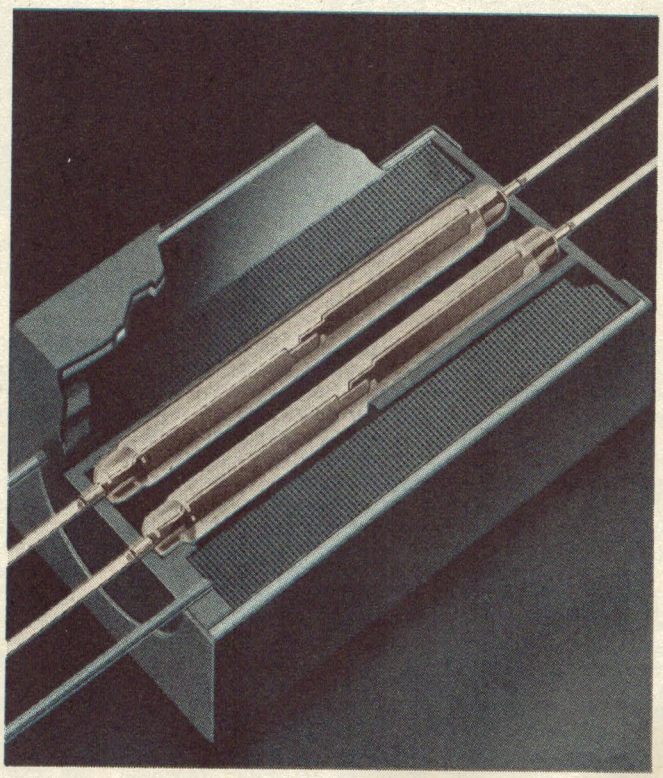

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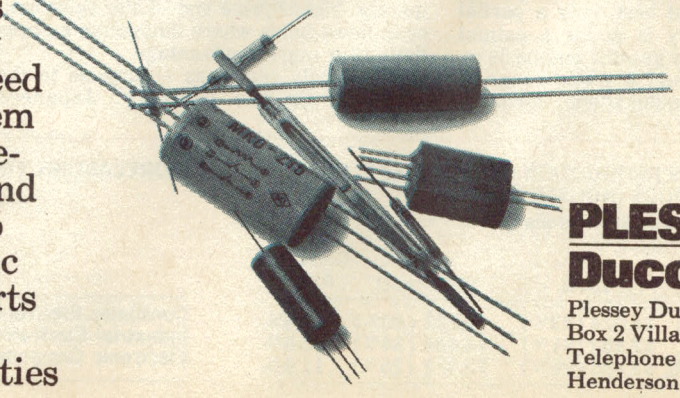

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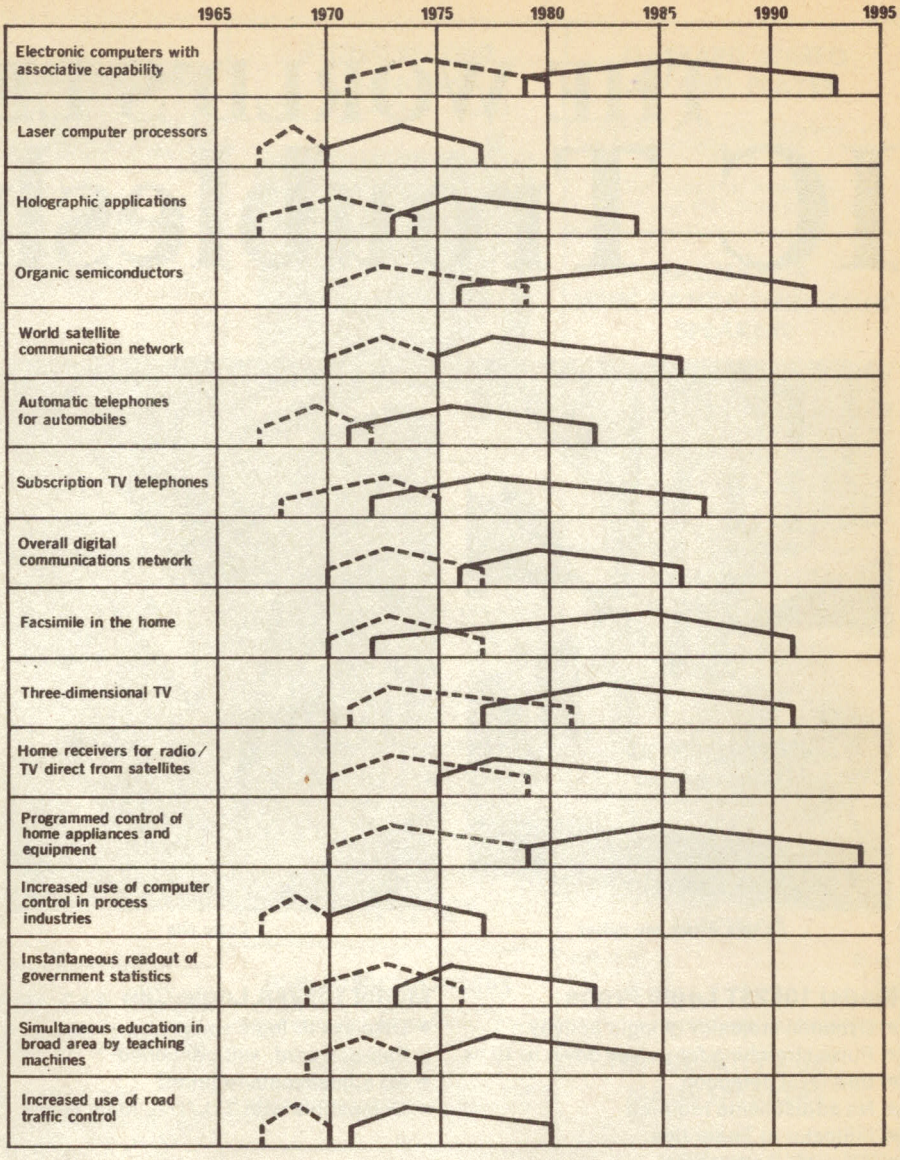
Japanese industry . . .

1965 Japanese makers have been moving much of their labour-intensive production to developing nations. In Taiwan, 40 Japanese manufacturers have joined 24 American and three Dutch companies to tap the available resources of skilled labour and take advantage of investment incentives on the island. The move to Taiwan was in part a stratagem designed to channel production of TV sets and transistor radios to the US through a third country not likely to be subject to the dumping criteria and other punitive measures against Japanese competition.

In 1969, Hitachi began exporting its black-and-white TV sets in knocked-down form to its two joint subsidiaries in Taiwan to have them assembled for export to the US. For the past two years, Hitachi has supplied the American market with monochrome TV sets from its Taiwan factories and colour TV from Japan. But since Taiwan is now producing colour TV as well, and colour TV from Japan has come under especially vociferous attack in the US, it would seem only a matter of time before these products are also supplied from Taiwan or Korea.

Many Japanese companies are now manufacturing components and complete consumer products in South Korea, with most of the production destined for export to Japan and the US. An alternate strategy adopted by some makers is to produce the needed labour-intensive components in Taiwan or Korea, import them into Japan for final assembly along with advanced components made in Japan. In this way, Japanese finished consumer products have been able to retain much more competitive power than would have been possible with rising wages at home.

As a result, within the short period of five years, the profile of Japanese electronics production changed radically. In 1970 monochrome television had dropped to 4.2% of total electronics output, and radio receivers, at 4.9%, accounted for only a shade more. Japan's strength was clearly in tape-recorders and colour TV, which accounted for 7.1 and 20% of electronics production, respectively. But since colour TV is now in serious difficulty and is likely never to recover its former growth impetus, much of the drive is out of consumer electronics, at least for the moment.



Projections by the Japan Electronics Industry Association of developmental activity for critical new technology (broken lines) and the planned life cycle of products in each area (solid lines) reflect the basis for forward planning in the industry. Since the Japanese electronics industry will assume a role of increasing world leadership, these projections have special import for the global electronics industry and for consumers everywhere.

This being the case, Japanese manufacturers are currently striving to expand their fields of new products, such as VTRS, calculators, computers and peripheral equipment, telecommunications equipment, and automation devices. In 1970, the value of total electronic output in Japan equalled that of the automobile industry and accounted for 22.8% of total production of the machinery industry. But, unlike the automobile industry, prospects for continued rapid growth of the electronics industry, as Japan prepares for the information revolution, continue to be good in the medium- and long-term.

Continued innovation will sustain a steady, if not rapidly growing, consumer goods production. IC and LSI applications will lead to further miniaturisation. Video tape recorders are expected to reach the take-off stage in 1972, with the domestic market reaching $1.8 billion per annum by 1980. This compares favourably with the $1.4 billion output of colour TV in 1969, especially when the percentage of the $1.2 billion US market which Japan can be expected to capture is added.

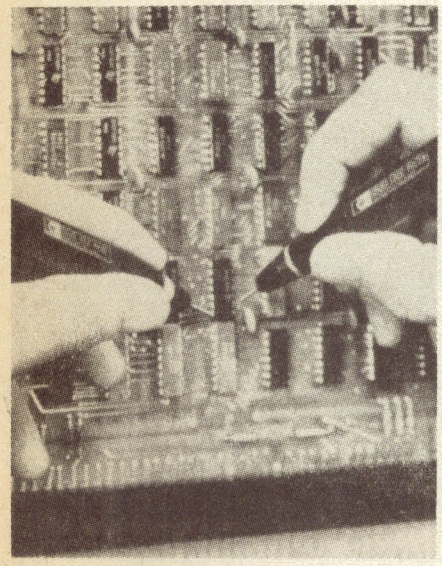
But the big growth will be in the industrial electronics field during the remainder of the century. Both computer and automation equipment output are expected to grow in excess of 30% a year through 1980, and a whole range of new exotic electronic products will be introduced during the 1970s, adding another expected $2.2 billion to electronics output by 1980 — for the domestic market alone.

Japanese manufacturers may also expect to participate in the American and other world markets for CATV systems, videophones, home facsimile, data communications terminals, and other products of advanced telecommunications technology in the future, either through exports, licensing or direct investments in production abroad.

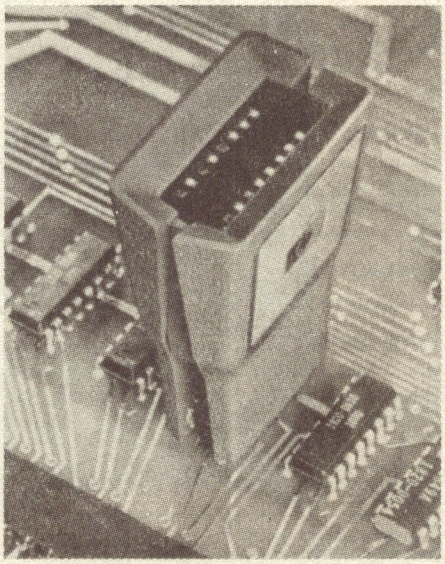
As a result, there will be a basic change in the character and structure of the Japanese electronics industry. Whereas consumer electronics has accounted for about 43% of the output of the industry during the 1960s and industrial electronics about 31%, during the 1970s growth will increase considerably faster in industrial than in consumer electronics.

Firms such as Fujitsu, NEC and Oki, which are heavily concentrated in computers, telecommunications and automation — all fast-growing sectors of the industry — are emerging as the growth leaders of the future. To be sure, diversified manufacturers such as Toshiba, Hitachi and Mitsubishi Electric will also play an important role in all three sectors. And a growing number of component and other electronics products manufacturers will shift an increasing amount of their resources to mini-computers, peripherals, data communications terminals and other

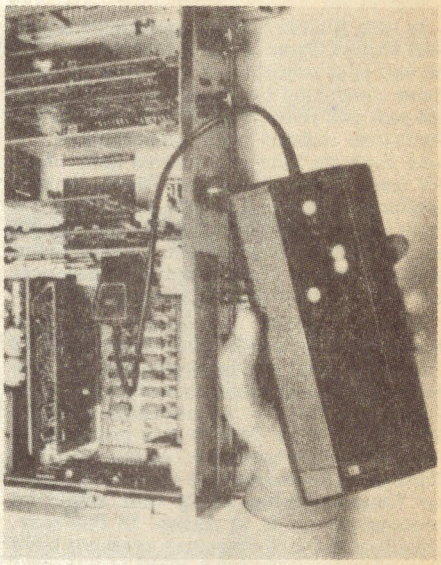
THE WORLD'S LEADING
IC Troubleshooters



Logic probe and pulser



Logic clip



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- Simple to use with no adjustments
- Dynamic errors stretched and displayed
- Compatible with TTL/DTL logic levels
- Self-powered

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growth products.

All six of the above "advanced electronics" companies will also share in the current six-year national space effort. The program is to begin with an ionosphere sounding satellite (ISS), which will be used to help forecast the best frequencies for radio transmission around the world. Within two or three years, government spending is expected to be double the current $42-million, but it will be five years or more before Japan has an "industrial" space program.

When the industrial program does come through, chances are that the newly-formed National Space Development Agency will become a public corporation rather like Nippon Hoso Kyokai (NHK), the public broadcasting corporation. The space corporation would take under its wing the disparate space research and development activities presently scattered among half a dozen ministries.

Defence electronics has had little part in the development of the Japanese electronics boom in postwar years. With military spending not likely to rise much above 1% of GNP, there's little chance of any massive rise in military spending for electronic products. To a man, executives of Japan's electronics companies see defence as a slow growth market, although the feeling is that electronics' share of the defence budget is on the rise.

Component production, on the other hand, will be strained to keep up with the country's fast-stepping equipment makers. With components running at about 26% of total electronics output, or roughly $2.6 million in 1970, this sector of the industry has been growing at about 24% per annum in recent years.

As in the US and western Europe, the IC market has been generating the most excitement. But Japanese manufacturers have had more going for them as TV makers move to introduce IC models. Then, too, there has been the arrival of mass-produced desk calculators using ICs, as well as new consumer items like IC watches and IC camera flash controls. At the rate things have been going, by 1973 ICs will match discretes in value — an increase of 400% in four years.

As ICs are used more widely, their content is changing. US producers, who got off to a big lead in MOS, can now look for some tough competition from Japanese makers — at least in the home market. MOS / LSI are already being used in electronic calculators, and computer peripherals are expected to give MOS a boost in 1972. Another important market for MOS will be in data terminals, the production of which is expected to boom when the Nippon Telephone and Telegraph Public Corporation begins expansion of its public data communications network.

Semiconductor producers all see glittering prospects for optoelectronics, and most of them have come out with new improvements over the ubiquitous "Nixie" tube. Sony's 16-digit "Planitron" display is perhaps the most revolutionary development in the field to date.

While components manufacture, like other sectors of the industry, has held little opportunity for foreign firms in the past, this is changing with the capital liberalization program now in its final stages. The ban on wholly-owned ventures by foreign firms is likely to remain, however, and before foreign investors come around to acceptance of the fact that in Japan, with or without liberalization, it is probably better to have a good Japanese partner, the Japanese industry will have closed ranks in a series of mergers and other reorganisation moves.

It has already become apparent since the Nixon shock that many of the medium-sized manufacturers of consumer electronics are going to be merged with other manufacturers or with marketing organisations. Since many of these firms have been competing with standard products on a price basis and do not have their own sources of new advanced technology, they increasingly find themselves in competition with products from developing countries.

In recent months, Crown Radio has merged with a large Japanese supermarket chain which will provide a tied-in marketing organisation for its production. Superscope, an American distributor of tape-recorders, is taking a major interest in Standard Radio, which it intends to use as a source of quality electronic products to replace those previously distributed under franchise from Sony. General Corporation, which manufactures a range of medium-priced home electronic products, is being gradually brought under Toshiba management. And Nippon Columbia is being absorbed by Hitachi.

Leading manufacturers, who in the past followed the practice of sub-contracting supply of parts or components for their products, have also begun reducing their rate of reliance on subcontractors in preference to manufacturing such items themselves. This trend stems from the character of new technology, the greater scale of production of the "parent" firms, the rising costs of subcontractors who have been hit hard by recent wage hikes, and the necessity of achieving greater efficiency through capital-intensive automation which only the larger firms can afford.

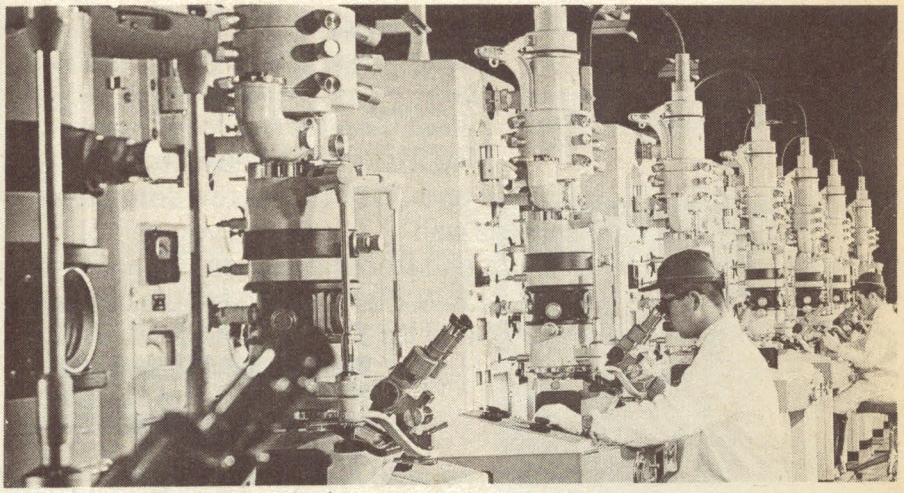
Reduced dependence on subcontracting firms has been particularly conspicuous in the electronics industry where technology has been advancing at a near breakneck pace. Fujitsu Limited formerly subcontracted half of the total production of its Kawasaki plant. This was cut back significantly when they introduced integrated circuits, which reduced the need for mechanical processing work on computers and telecommunications equipment.

The reorganisation of the Japanese electronics industry will be accompanied, and to some extent compelled, by more intensive research and development outlays. It will be increasingly true that companies which have their own advanced technology will survive and grow; those that do not, will not.

To the extent that Sony's experience sets the pattern, larger outlays for innovation will become a characteristic of the entire Japanese electronics industry. Since technology is becoming increasingly complex and as the cost of developing new advanced technology rises exponentially, this in turn adds to the forces of concentration in the industry. This is most apparent currently in the computer sector, where the complete series of 3.75- or 3.8-generation computers will probably cost somewhere between $150 billion and $300 billion to develop. It was just this consideration that induced Hitachi and Fujitsu to join forces in computer production.

An increasing amount of Japan's human and financial resources will be devoted to the development of new technology because industry leaders are acutely aware that their future growth will be possible only if they can assure a continued high rate of innovation, which must be done now largely through developing new technology rather than through imports from other countries.

Given the top priority attached to technologies essential to the information revolution, and the central role of electronics among them, the main thrust of Japan's innovative force will be in this field. This being the case, Japan can be expected to emerge as a principal source of advanced electronics technology during the last quarter of this century, adding further stimulus to the trend of internationalisation. Higher investment in R&D will force Japanese makers to maximise returns on investments on a global scale, which will mean greater investments abroad, in advanced industrial and developing countries alike.



Industrial and medical test instruments are an ever-growing segment of the Japanese electronics industry. Above, a pair of technicians put electron microscopes through their paces at the final inspection line at Hitachi, Ltd.

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35 W	AY8171	NPN	TO66	60	0.7 V @ 3 Amp	30 @ 3 Amp/4 V
35 W	AY9171	PNP	TO66	−60	0.4 V @ 3 Amp	20 @ 3 Amp/4 V

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Time code also aids deaf viewers

TV Time, a "piggyback" system for sending captions in code on the bottom line of a TV screen, has given new hope to deaf TV viewers.

A recent demonstration on American network television proved the value of a new TV-caption system for the hearing-impaired viewer. Developed by the US National Bureau of Standards (NBS), Boulder Laboratories, the system offers deaf viewers a new look at television.

Captions, sent in code by TV studios in New York, were viewed on TV receivers at a conference on "captioned television for the hearing impaired" held in Knoxville, Tennessee. The receivers there were equipped with a special decoder circuit that displayed the dialogue of the regular program on the TV screen.

The captions, a pair of lines of print at the bottom of the screen, can be prepared in advance and added to the program, or they can be typed in as the program is aired (during live broadcasts, for example). They may originate at the network studio or at any local station, and the originating equipment is relatively inexpensive compared to the cost of a TV camera or other broadcasting equipment.

Broadcast as part of the program, the captions do not interfere with normal reception and can be turned off if desired.

The caption service was developed by the NBS Time and Frequency Division as part of its TV Time system, which can also provide precise time-of-day information, emergency messages, and channel identification — services benefiting all viewers, not just the hearing impaired.

The TV Time System was developed by NBS to disseminate accurate time throughout the US. It codes a tiny portion of the signal that broadcasters normally transmit with alphanumeric information such as time of day, channel identification and special messages.

The television industry has tried numerous experiments with sign language subtitles and special scramblers using cable or phone lines to bring the audio portion of TV to the hearing impaired. These experiments have met with only moderate success because they tend to distract the audience with normal hearing. The television industry has been co-operating with NBS to demonstrate the system in order to overcome these objections.

NBS engineers estimate that the simplest time decoding module, which may be available as early as 1973, would cost less than $US20 if mass produced and installed in the factory. Captioning modules with numerous options to assist the hearing handicapped would be in the $US50 range.

Local television stations would be able to buy the equipment to provide their viewers with precise time of day information, captions, channel identification, and visual emergency messages. None of these services would interfere with normal viewing or broadcasting.

Time can be displayed directly on the TV screen in small numerals indicating the hour, minute, and second, or used to automatically correct an electric clock located in the TV set or at some distance. In addition to time, the system provides standard frequencies accurate to one part in 100,000,000,000.

At present, only a few researchers with specially modified TV receivers can detect the signals.

Existing TV receivers are not easily modified to provide this service. To be practical, and to keep the cost within reason, the circuit and clock must be installed by the manufacturer. It is interesting to note that a number of home TV sets are sold with built-in clocks. For a small additional cost, these clock-TVs could be designed to reset themselves automatically when the program being viewed contains time-code pulses.

The time code itself is not seen by the viewer and does not affect TV broadcast operation. During four of the thirty odd fields each second, the time-code generator imposes a coded 1-MHz signal on the active trace of line one. The equalising pulse is not disturbed. The code carries information designating the hour, minute, and second (HMS). This part of the code contains a unique digital prefix, enabling the decoder to recognise it and display it in proper sequence. The code is sent twice (code and complement) to avoid error.

The decoder in the TV set has a built-in

digital clock that is set by the time code. If no code is received, the digital clock "flywheels" on its internal 1-MHz oscillators. The accumulated time error under these conditions will not exceed 0.1 second per day.

Once the code is received and recognised, it is displayed (when desired by the operator) as small numerals 20 lines high at the bottom of the screen. The numbers change in exact step with the master clock at the broadcast station or network origin. There is provision for selecting the time zone; daylight-savings-time corrections are automatic.

If desired, the decoded BCD (Binary Coded Decimal) signal for hours, minutes, and seconds can be distributed via cable to drive remote time indicators employing ordinary digital-display techniques.

Although not intended for general use, a precise-time code with better resolution than one micro-second is also transmitted. This code is alternated with the HMS code on line one, and has its own digital prefix for identification. It is not seen by the viewer and does not affect normal operation of the set. With suitable circuitry, the HMS decoder also recognises the precise-time code but does not display it directly as it does the HMS. Instead, it measures the difference between a local clock (at the decoder site) and the standard or master clock at the time-code injection point. It then reads out (in numerals on the screen) the time difference, in micro-seconds, between the two clocks.

The system cannot determine the total path delay between the clocks, and therefore treats this delay as a clock error. A user requiring precise synchronisation must calibrate his system by determining the total path delay from injection point to receiver. A one-pulse-per-second (1-pps) signal also is available from this system because the internal comparison is made at a 1-pps rate.

If this service is inaugurated on several networks, the user will be able to cross-check his results; this checking will permit him to discover if one of the network signals has been rerouted on the commercial microwave system. Experiments conducted by NBS indicate that this method of precise-time dissemination has an accuracy of about 2 to 3 micro-seconds over coast-to-coast paths.

The complexity and cost of this system is slightly more than the HMS decoder. However, LSI techniques promise to make the cost very reasonable and commensurate with the service obtained.

A main feature of the proposed NBS TV time-and-frequency system is the low-cost availability of a precise frequency. This system supplements the measurement of frequency from IF or HF radio stations. The television frequency-comparison system is fast and accurate.

The proposed TV time-and-frequency system also transmits a 1-MHz carrier frequency during the active portion of line one. During the interval between the first and second equalising pulses of fine one and line 262½, the stable 1-MHz carrier is always transmitted without code modulation.

At the decoder, this signal is recovered by a phase-locked oscillator in much the same way that the colour subcarrier is detected in a colour-TV receiver.

Measurements at the NBS Boulder Laboratories indicate that it is possible to calibrate a local frequency source to one part in 10^{11} in half an hour using this accurate frequency. This represents an improvement in frequency calibration of several orders of magnitude over any technique now available, and the cost is only a fraction of competitive methods.

To receive the 1-MHz signal, the user must have the frequency decoder or an HMS decoder. The 1-MHz frequency is then directly available for TTL digital ICs.

The caption making facility of the TV Time system, which uses an entirely independent alphameric message processor, was developed as a convenient message channel from network to local stations. From this system came the idea to transmit messages to any home viewers who were willing to pay extra for the decoding units.

The messages are transmitted during the portions of line one that are not used for time-and-frequency signals. These signals occupy the first 4 line ones of each second, leaving 24 line ones available for data transmission. An additional message processor could utilise 24 of the 30 slots-per-second in the even field on line 262½.

The message processor encodes two ASCII characters on each of the 24 slots of the odd field. The data-transmission rate thus is 48 characters per second, or 96 if another processor is used.

Messages are entered at the "send" terminal on a standard ASCII keyboard. Messages up to 512 characters in length (16 lines x 32 characters per line) may be entered and verified on a video monitor at the "send" terminal before transmission. Provision is included in the message-sending processor for storing two messages before transmission; storage is expandable by adding more memory cards.

When the "send" key is depressed, the entire message block of 512 characters is transmitted. Transmission time is approximately 15 seconds.

At each local broadcast station in the network equipped with a message-receiving processor, the transmitted message is verified, stored, and displayed on a video monitor in the same format as transmitted. In addition to its ability to receive network messages, each receiving processor has provision for local-keyboard entry. Local broadcasters thus can use it as a video title generator, with all 64 ASCII characters available. However, messages cannot be returned to the network using the message receiver. The message-receiving processor operates in conjunction with the receiver time decoder.

The TV Time system is expected to provide private industry with technology to supply many new services to TV viewers, such as stock market reports, classified advertising, informational and educational programs, racing results, etc. It could eventually be interconnected with a two-way system which makes use of the standard telephone keyboard to respond to incoming questions — possibly for voting or for program popularity surveys.

US colour sets will not work on our colour signals

Jamieson Rowe's question-and-answer article on colour TV in our April issue has prompted another question: Should American immigrants who own a colour set bring it with them to Australia or is it better to sell it there and buy a local set when colour starts here in 1975?

We thought our readers would be interested in Jim Rowe's answer, which follows:

Unfortunately an immigrant who hopes to use his set to receive Australian colour TV programs is almost certain to be disappointed. The reason for this is that although American, Japanese and other colour receivers made for the NTSC colour system use many of the same basic parts — like the expensive colour picture tube — an important section of their internal circuit wiring is quite different from that required to receive the PAL colour signals.

This being the case, to convert such a receiver would involve virtually complete redesign and rebuilding of the critical section of the circuit. And generally this would involve many, many hours of work for a highly qualified engineer, assuming that you could find one capable and willing to do the job. The cost would necessarily run to hundreds of dollars, if carried out on a commercial basis.

An NTSC system colour set can generally be converted relatively easily to receive our present monochrome transmissions. Most such receivers require much the same work needed to convert a foreign monochrome receiver, which presently costs between about $30 — $50. Whether this would be a proposition compared with buying a new monochrome set when one arrives will no doubt depend upon how much could be realised on the colour set before leaving.

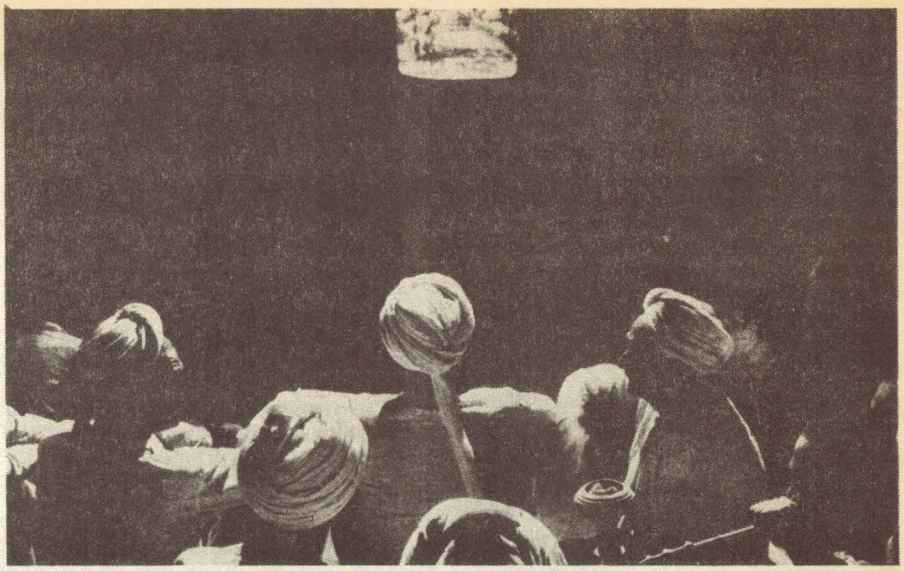
Note that the foregoing comments only apply to colour TV receivers from the USA, Japan or other countries which have been designed for the NTSC colour television system. With colour receivers from England or Germany it should not be very difficult to have them converted for Australian colour, as these countries use the PAL system which we will be using. The same may apply for receivers from other European countries, although there is a third colour system called SECAM which is used in France and the USSR and may also be used by other countries. A receiver designed for the SECAM system would be just as difficult to convert as an American set.

It should also be noted that many of the Japanese electronics manufacturers make colour receivers intended for use in England, Germany and other countries using the PAL system. Generally such receivers should also be relatively easy to convert for the Australian colour system, in contrast with those receivers from the same manufacturers intended for the USA or domestic Japanese markets. So that travellers buying small portable colour sets in Asian ports should look very carefully at the specification plate to ensure that it is marked "CCIR" or "PAL-system," and not "NTSC" or "Secam".

Indian Television Industry

A report from N. VISWANATH

The expanding Indian TV receiver industry is going its own way, preferring to do local research and development rather than adopt foreign designs. With several new transmitters under construction, the future looks bright.



A group of villagers watching an educational television program on agriculture near New Delhi. Many of the larger sets are bought by whole villages and "Tele Clubs" for community viewing. Battery portable sets are now becoming available for villages without electricity.

The Indian television industry has made rapid strides in the two years since its inception. Having all the ingredients of growth, this infant industry is now gearing itself to meet rising demand with the setting up of five new television broadcast stations.

At present, New Delhi is the only city in India with a TV station. The proposed five stations are to be located at: Bombay, Calcutta, Madras, Kanpur and Srinagar.

In spite of late entry into the field of electronics, Indian television sets have been based on indigenous know-how with a minimum of foreign technology being used. The sets stand well in comparison with international standards.

The Central Electronics Engineering Research Institute at Pilani in Rajasthan State developed an indigenous television set in 1959 long before the Indian television industry was born. It took many years for the Government of India to realise that production companies could be set up easily in the country itself. Then licensing procedures took a long time, and not until 1969 could the first factory roll out the sets.

A few Indian entrepreneurs put their confidence and faith in the technological know-how of the Pilani Institute and invested large sums of money to set up factories to produce TV sets.

The Government of India then gave licences for four companies with a capacity of 30,000 sets annually — J.K. Electronics Telerad, Polestar and Telestar. This was mainly based on the demands of Delhi alone. Two of the manufacturers — Polestar and Telestar — belong to the small-scale consortia, while J. K. Electronics and Telerad are in the large-scale sector.

An original quota of 10,000 sets was granted to J.K. Electronics and Telerad per annum, while it was 5000 sets per year for Polestar and Telestar. The first factory, J.K. Electronics, first produced TV sets (which were kept for sale in Delhi) in February 1969. Since then, several thousand sets have been produced.

By autumn of 1970, all four companies went into production and within months they were able to reach production sufficient to meet the demand of receivers in the Delhi region — estimated as 20,000 sets per annum. Recently, Bharat Electronics Limited, Bangalore, and Electronics Corporation of India, Hyderabad, were granted licences for a capacity of 20,000 sets each per annum.

The two large-scale companies have a capital base of Rs12 lakhs (1.2 million rupees, or at 8.5 rupees to the dollar, about $140,000) each; the small-scale companies each have a capital of Rs7.5 lakhs ($88,000).

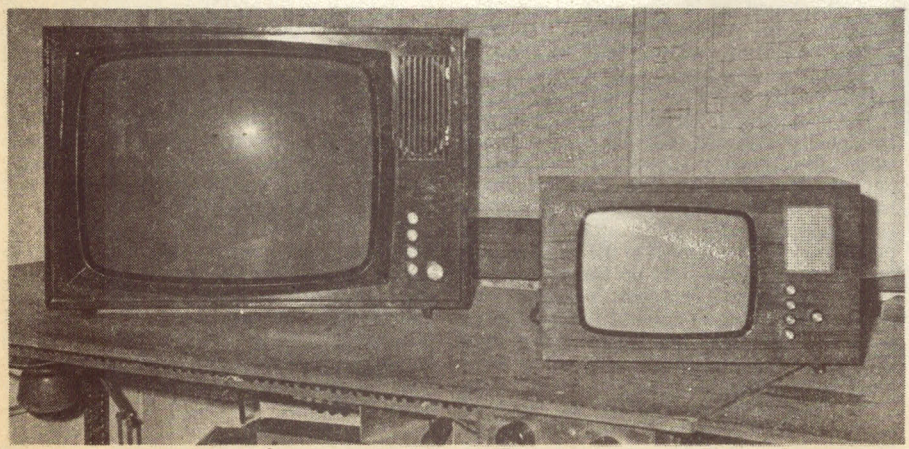
A remarkable feature of the Indian sets is that they have certain advantages not possessed by some imported sets, eg DC restoration, noise inverter, auxiliary sync circuits, etc. In particular, the picture quality is clearer and sharper than imported sets. This has been possible by the greater care taken to ensure the best quality at a little extra cost. Many foreign TV manufacturers cannot do this because of their large-scale production, higher cost of labour, and fierce competition which compel them to effect small economics which, in turn, affect picture quality.

In television technology, thermionic valves, transistors, and integrated circuits represent first, second and third generations. The Pilani Institute has already displayed prototypes of 12-inch portable transistorised sets and Polestar in Bombay has leap-frogged one step by going into the third generation of IC technology. A completely IC-based TV set has yet to come off the assembly line, however.

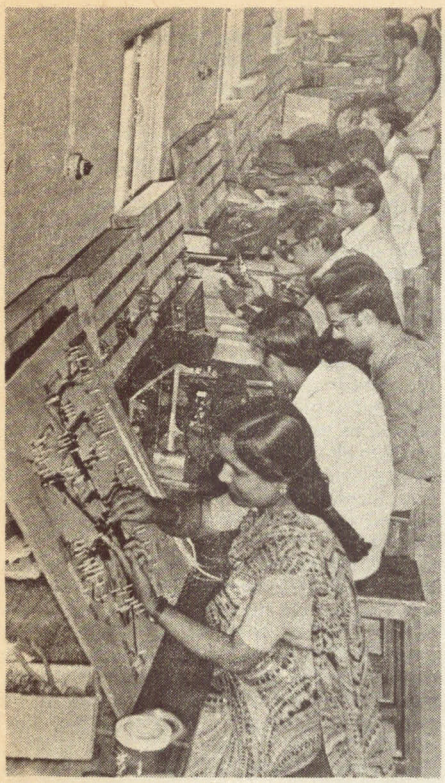
The price of an Indian 23in TV receiver is about Rs2400 ($280), of which Rs1780 ($210) is the ex-factory price, Rs 178 ($21) is excise duty, Rs195 ($23) is sales tax, Rs130 ($15) is for the aerial. The balance is for installation.

As compared to Indian sets, the cost of a 23in Japanese set is only Rs800 ($95), while that of a European set is about Rs1500 ($175). The main reason for the high cost of the Indian sets is the high prices of various components, especially picture tubes which are imported at about Rs350 ($41) each. Any reduction in component prices is not possible until the new stations at Bombay, Calcutta and Madras create an increased demand for receivers.

Some attempts are, however, being made by the four original companies to develop and market cheaper sets, ie 12 inch and



An 11-inch fully transistorised set made by the Electronics Systems Division of the Indian Space Research Organisation, compared in size to an earlier model.



Technicians at work in the Indian Space Research Organisation, one of the newer TV receiver manufacturers in India.

even 12 inch portable sets suitable for smaller rooms. The 23 inch sets are good for hotels, classrooms and community-viewing in Tele clubs. A 19 inch set has now been marketed at Rs 1,700 ($200). With increased production, this price is expected to come down to Rs1500 ($175) each.

Polestar of Bombay was the first to put on sale India's first deluxe TV set, named "Standard". The main features of this set are:

59 cm (23in) implosion-proof picture tube.

Front-mounted 2-speaker system for forward, high-fidelity sound.

Vertically-mounted decorative front panel.

Auto-synch and noise-inverter stages for crisper pictures.

Champagne-gold "mask" for elegant picture-frame effect.

Recently, the Electronics System Division (ESD) of India's Space Research Organisation at Ahmedabad, released three models of a new transistorised TV set suitable for use in villages not served by electric power. They are in sizes of 11 inches, 19 inches and 23 inches. The respective prices are: Rs1000; 1500; and 1700. It is now proposed to manufacture 200,000 sets of this category in the course of 1972.

The Bombay TV station is expected to be ready by December this year. It will have a 1000ft broadcast tower. Equipment like the video, transmitter and the relay apparatus has been obtained through West German aid. The total cost of the equipment is about 10 million rupees. Other expenses have been put at 7.5 million rupees. West Germany has started training Indian technicians to man the station.

Solid-State 52MHz Converter

Here is a modern solid state design which offers high sensitivity, low noise and full bandwidth, combined with modest cost. Built on a small printed wiring board for easy assembly, it features a protected dual-gate MOSFET in the RF stage, and a balanced FET mixer.

by IAN POGSON

As a follow up to the 130 Tunable IF Receiver described in April and July, 1972, we now present a companion converter for the 52-54MHz band. In arriving at a suitable design, several factors were kept in mind. The converter must be economical and easy to build, but it must also be a good performer. It should also be easy to adjust and give rise to a minimum of spurious responses. We believe that all these points have been met satisfactorily.

In addition to the above features, in common with the 130 Receiver, it must be possible to operate it from a 12 volt DC supply, either stationary or mobile. For mobile use, positive or negative earth connection should also be available.

A look over the circuit will show how this has been done. The RF amplifier is the now familiar cascode. Rather than use a pair of discreet FETs, we have used a Motorola dual gate MOS field effect transistor (MPF121), which also features diode protected gates. In addition to the obvious advantage of using only one device in this stage, the particular arrangement permits a very simple circuit, with a minimum of components. The price may well be less than for two discreet FETs which would otherwise be needed.

Although the MPF121 dual gate FET is diode protected, we have provided for an external pair of protective diodes, such as OA91, on the aerial input to the board. These are optional and the choice is left to the builder.

To help in achieving as wide a bandwidth as possible, we used two pairs of coupled circuits at signal frequency, one each at the input and output of the RF amplifier. These are adjusted and tuned to achieve this end and more will be said about this in the alignment details.

The mixer uses a pair of balanced FETs, type 2N5485. This type of mixer was chosen on the score that it is possibly one of the most economical ways of obtaining good mixer performance with a minimum of cost and complexity. Using active devices obviates the need for an additional amplifier following, and by balancing the mixer, oscillator breakthrough is reduced to a minimum. To ensure balanced operation of the mixer, provision is made to finely adjust the balance with a 2.2K potentiometer in the sources of the FETs.

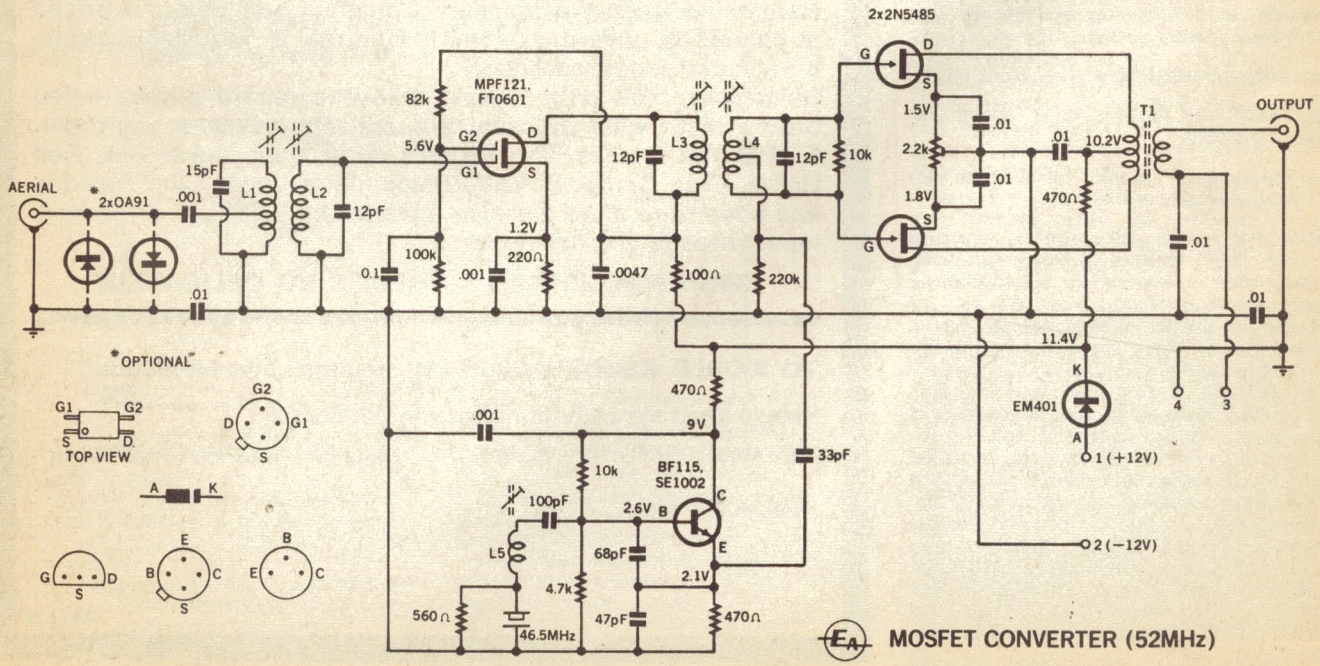
The functions of providing a suitable load for the drains of the two mixer FETs, impedance and balance to unbalance transformation are all incorporated in a small transformer wound on a TV "balun" ferrite core. Again, the approach is one which is simple, economical and effective.

The source of injection into the mixer from a crystal involves one stage only. Use is made of a crystal oscillating on its third overtone and directly on the wanted frequency of 46.5MHz. Not only does this avoid an additional multiplier stage, with its consequent economy, but it also avoids the need to generate the wanted frequency at a sub-multiple, which can be an extra source of unwanted spurious responses in the overall receiving system. The oscillator uses a conventional bipolar transistor and the circuit is one as recommended by the crystal manufacturers, Hy-Q Electronics Pty Ltd.

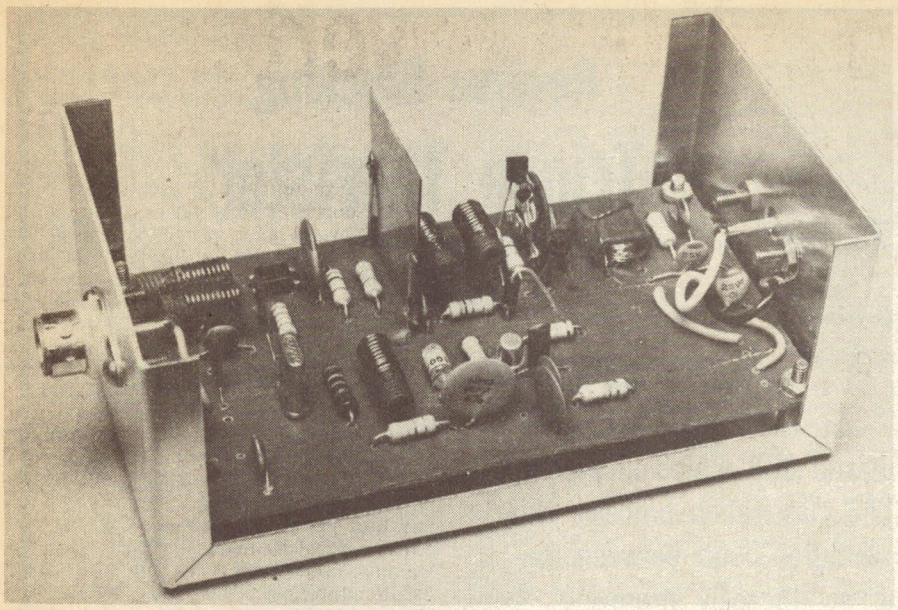
The crystal frequency of 46.5MHz which we have used, is arrived at so that we can use it on the 130 Receiver which tunes from 3.5 to 7.5MHz, with 52 to 54MHz being covered between 5.5 and 7.5MHz. If it is desired to use another tunable IF range, then the crystal frequency will have to be changed accordingly. As an example, supposing we wish to tune from 10 to 12MHz, then a crystal frequency of 42MHz will be required.

On the printed board, provision is made for a diode in the positive supply rail, to guard against possible damage due to inadvertent reversal of the supply polarity. As part of the provision for mobile use, a number of terminations are also provided to allow the greatest flexibility with regard to connection or not of either side of the supply line to frame.

Although the idea is by no means original, an unusual feature is incorporated with the terminations mentioned above. We have provided facilities so that the power supply may be fed from the receiver into which the converter is coupled, via the centre conductor of the coaxial cable between the two



EA MOSFET CONVERTER (52MHz)



The prototype converter. The output to the tunable IF is at the right.

units. The supply return is via the outer braid of the cable. This eliminates the need for extra conductors between the units, and simplifies bandswitching.

There is nothing very special about any of the components but a few words about some of them may be helpful. Most of the capacitors in the prototype are ceramic and it would be wise to stick to those specified in the parts list, unless you have any particular reason for departing from it.

The balun core which we used for the output transformer is readily available and any similar core to those specified should be in order. The slugs for the coils which we have called for are ideal for the purpose. However, any slug between 7 and 8mm in diameter and ½in long should suffice, provided it is suited to the frequencies involved.

With respect to the transistors, we strongly suggest that you use the FETs which appear in the prototype. The crystal oscillator transistor may be any near equivalent to the BF115 or SE1002. The diodes may be substituted with any other similar types. As mentioned earlier, the two OA91 protective diodes are optional and although we have provided space for them on the board, we have not fitted them. The power diode in the positive supply line may also be omitted but it provides very worthwhile protection against accidental reversal of the supply polarity.

The crystal which we used was made by Hy-Q electronics. The type is given in the parts list and these details should be quoted when ordering. There are a number of other manufacturers who make a similar type of crystal and any of these should be satisfactory. Only modern crystals made specially for this service are likely to be satisfactory. The idea of using an old type FT243 can be ruled out as the likelihood of one of these even functioning at all in this circuit is rather remote.

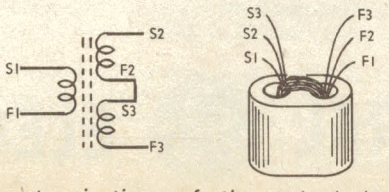
The type of coaxial sockets will naturally be up to the choice of the individual, as they will more than likely have to fit in with existing equipment. Also, the case which we have used is a standard line and may be obtained readily, some builders may have other ideas regarding housing of the unit.

Perhaps the best place to start with the construction would be to wind the five coils and the output transformer. The coils are simply wound directly on the slugs and this results in an efficient coil with a minimum of cost. The wire must be wound firmly around the slug, so that it does not spring open to result in an unduly loose slug. The taps may be made by determining the spot on the wire, cleaning the enamel off for about ¼in. The bare wire is tinned and this length is bent back on itself and straightened out from the two junctions of the solder and enamel. The coil is then wound with the tap facing outwards and with turns added each way so that the tap appears at the right number of turns.

When each coil is wound, the ends are bent radially and cut off with a lead of ½in or so. This lead is stripped of enamel and tinned. Later, on assembly, the lead may be cut precisely to the required length.

The output transformer is "trifilar" wound. This means that we start off with three lengths of wire, sufficient to wind on the required number of turns. The three wires are brought together in parallel and to make threading through the holes of the core easier, a sewing needle may be used. Thread the wires through to the centre first and wind on 10 turns. Then change the needle over to the other end of the wire and wind on another 10½ turns. The extra half turn allows the start and finish of the windings to appear at opposite ends of the transformer assembly. This allows more convenient terminations on to the board.

The three windings are terminated as shown in the diagram and preparatory to this, each of the six ends are cut to a length



The terminations of the output transformer.

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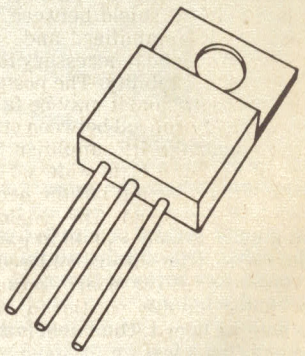

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C122F	50 Volts	50 Volts	75 Volts
C122A	100 Volts	100 Volts	200 Volts
C122B	200 Volts	200 Volts	300 Volts
C122C	300 Volts	300 Volts	400 Volts
C122D	400 Volts	400 Volts	500 Volts
C122E	500 Volts	500 Volts	600 Volts

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GENERAL ELECTRIC

of about 1in. The job of tinning the ends may be left until the transformer is actually being mounted on the board, at which time the actual lengths can be determined.

The actual job of assembly is particularly easy as a printed board is used. All of the smaller components, such as the resistors and capacitors may be soldered in place first, followed by the other items and possibly leaving the transistors and crystal last. The crystal oscillator coil may be mounted so that it just clears the board but the other two pairs should be stood off by about 5/16in or so. This is necessary so that the actual spacing and so the coupling between the pairs can be varied on alignment. The usual care should be exercised when soldering, to make good joints without overheating vital components.

It may be noticed from the photograph that there is a vertical shield between the FET cascode RF amplifier and the balanced mixer. We found it necessary to fit this in the interest of stability. The position of the shield is not vital and it may be fitted as shown, or it may be moved between other components towards the RF amplifier. We used a piece of tin plate 1¼in wide x 1½in high. The width is important but the height may be reduced if desired. The shield is held in place by two pieces of 18-20 gauge tinned copper wire. The wire is soldered to the negative copper of the board, brought through two holes suitably positioned, with ¾in or so above the board. The shield is then soldered to the two wires.

Having more or less completed the board, dictated by the application of the converter and the method of feeding power to it, there are some extra connections which will need to be made to suit. If the converter is to be used for mobile work, the question of positive or negative earth may have to be considered. As may be seen from the circuit, provision is made for jumpers to be fitted to the board so that either side may be connected to frame. This is straightforward and is self-explanatory.

If separate supply leads are to be used from an external source, then the +12V and -12V connections will be made to points 1 and 2, respectively. If on the other hand, you elect to feed the supply via the output coax cable, then for negative earth the braid of the cable, point 4, will be connected to point 2, and point 3 which corresponds to the inner conductor will be connected to point 1. Alternatively, for positive earth, 4 would be connected to 1, and 3 to 2.

At this point, for readers who are not familiar with this method of feed, this is how it is done. The connections for the converter end have already been established. At the receiver or tunable IF end, the 12 volt supply has to be fed into the coax cable without interfering with its ability to pass the wanted signal.

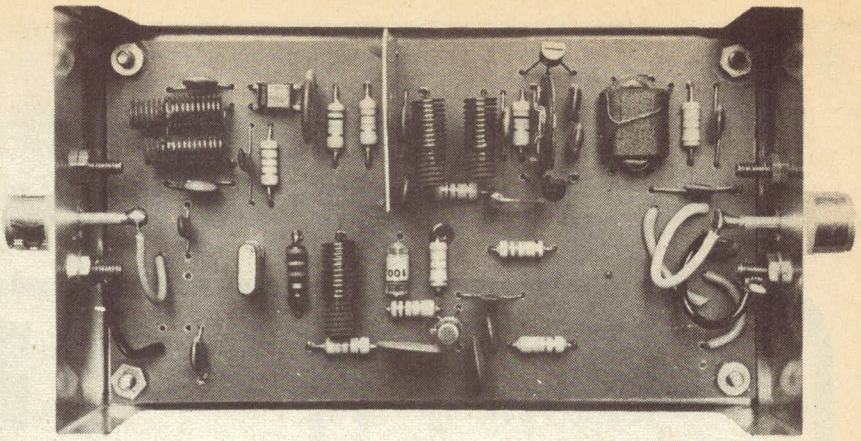
At the input to the receiver, a blocking capacitor is introduced in series with the centre conductor of the cable and the normal aerial terminal of the receiver. The +12V is fed into the coax centre conductor via an RF choke of 500uH to 1mH or so. The bottom end of the RF choke may need to be bypassed to earth. This and the blocking capacitor may be a 0.1uF ceramic capacitor. The negative supply is connected via the braid of the coax cable.

An alternative method, which avoids the need for an RF choke, is to series feed via the receiver aerial coil. The centre conductor of the cable is connected directly to the aerial input and the bottom end of the same winding is lifted from earth. This point is bypassed with a 0.1uF capacitor and perhaps a small amount of decoupling with a 47 ohm resistor, through which the +12 volts is introduced.

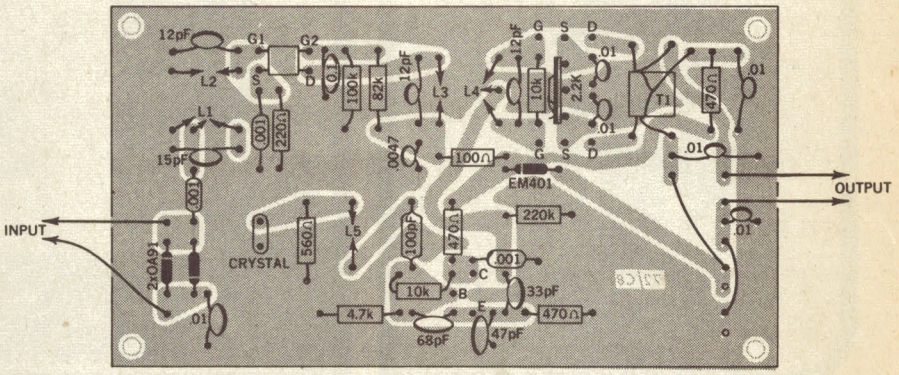
At this stage, a check should be made to make sure that there have been no errors or omissions in the assembly. Satisfied that all is well, the slugs in all coils are set so that they are about half way into the winding. The preset potentiometer in the mixer sources is set to mid-position.

Power may now be applied and it would be a good idea to check that all voltages are reasonably close to those shown on the circuit. It must be emphasised that there will be discrepancies due to spreads in components but this is normal. Satisfied that all is well, we are now ready for

(Continued on page 125)



Using this photograph and wiring diagram, constructors should have no difficulty following the author's layout.



Parts required

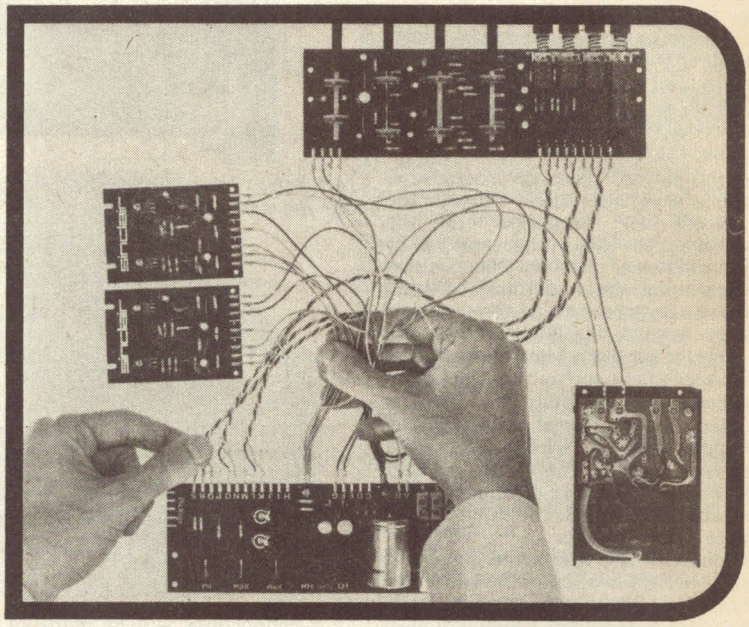
1 Case and lid, 5¼in long x 3in wide x 2⅛in deep
1 Printed board, 5in long x 2¾in wide, 72/C8
1 Crystal, overtone type, 46,500kHz ±0.003%, ambient temp, QC18 (HC18/U), Hy-Q type PES or similar
5 Neosid 7.6mm x ½in long, grade 900 slugs with hex bore
1 Neosid type 1050/1/F14, or Ducon type F684, Q2 balun core
1 Transistor, MPF 121 (Motorola)
2 Transistors, 2N5485 (Motorola)
1 Transistor, BF115, SE1002
1 Diode, EM401
2 Diodes, OA91 (optional)
2 Coaxial sockets
4 Spacers, ⅜in long x ¼in OD, ⅛in clearance hole
Screws, nuts, solder lugs, hookup wire, solder, etc.

CAPACITORS
3 12pF NPO ceramic
1 15pF NPO ceramic
1 33pF NPO ceramic
1 47pF NPO ceramic
1 68pF NPO ceramic
1 100pF polystyrene
3 .001uF 100V polyester
1 .0047uF 25V ceramic
6 .01uF 25V ceramic
1 0.1uF 25V ceramic

RESISTORS (½ watt)
1 100 ohms
1 220 ohms
3 470 ohms
1 560 ohms
1 2.2k trimpot
1 4.7k
2 10k
1 82k
1 100k
1 220k

Note: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, providing the ratings are not exceeded.

The do it yourself amplifier for non-technical people who hate soldering irons.



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TAKE 20 COMPONENTS

A further group of simple transistor projects, each using less than 20 low-cost components.

by JULIAN ANDERSON

One of the main aims of this series of projects is to introduce readers to a wide variety of simple circuits. With some exceptions, a few components can be made to do the job of a large number of components though less efficiently; however efficiency and accuracy are not always of prime importance. By designing and writing articles on very simple projects, I am not pretending that highly complicated circuits are a waste of time.

This shows up the "Take 20" philosophy; some designers — most of them in fact — try very hard to make their equipment operate as perfectly as possible. The "Take 20" attitude is to use the absolute minimum of components that will do the job. Of course the fewer components used, the easier the project is to build and the less the likelihood of mistakes.

Signal Generator

I mention this because our first project this month is an RF signal generator, which while very simple, will prove very useful when building other equipment and lining

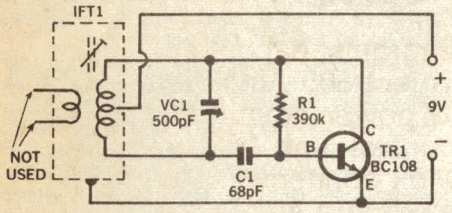


Fig 1. The circuit of the MW signal generator and BFO.

up superhet receivers, as well as acting as a beat frequency oscillator (BFO) for radios using either a 455kHz or 1.6MHz IF. It cannot however be compared to other designs for signal generators or commercial equipment of this type.

Fig. 1 shows the circuit. It consists of a straight-forward Hartley oscillator using a high gain NPN transistor. There is however no need to use the BC108, almost any RF transistor could be used — such as the old faithful OC44 — except of course when PNP transistors are used the battery polarity must be reversed.

Coils are not the easiest things to construct and where possible I try to use readymade ones, in this case an IF transformer of 455kHz. Most of these are fitted with a capacitor of 250pF or below, and by removing this and replacing it with a variable capacitor we will not only be able to tune to the IF but also cover the complete range of the medium wave broadcast band, if not on fundamentals then on harmonics.

The tuned circuit comprising the IF coil and VC1 is in the collector circuit and feedback is by means of C1 which couples back part of the signal to maintain oscillation. The value of C1 can be almost anything between 10pF and 1,000pF, its actual value being unimportant. R1 provides the base bias.

Building the signal generator is a simple matter and should present no problems; the layout of the components is shown in Fig. 2. The prototype was built on a pin-board but

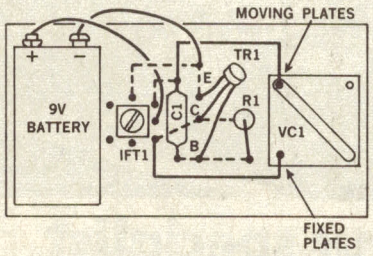


Fig 2. A suggested component layout for the signal generator.

Veroboard or Paxolin could easily be used. For equipment of this type an on / off switch is hardly necessary and removing the battery terminals will serve this function.

After switching on place the unit near a superhet radio tuned to a station and adjust VC1 until a whistle is heard. Unscrew the IF adjusting core and retune until VC1 is nearly in the fully-meshed position (maximum capacitance) when the whistle is heard. Some IF transformers will not be suitable for tuning this low but the actual position in unimportant. Set your radio to 530kHz and mark the position of the setting of VC1 when the signal generator is on that frequency, similarly tune to 1,600kHz and mark the position.

These two points, together with a mark where a whistle is heard on all stations, will be all that is necessary for lining up a superhet on the medium wave band. If the unit is tuned to the IF frequency of a receiver and placed near it a beat note will be heard enabling CW and SSB transmissions to be heard; all in all your signal generator should prove to be a very useful piece of equipment.

Parts for Signal Generator

R1 390k ¼ watt miniature 10%
C1 68pF — see text
VC1 500pF variable
Tr1 BC108 — see text
IF Transformer, 455kHz

Miscellaneous
Paxolin board, 9V battery, battery clips, knob etc.

Lie Detector

Assuming that the reader has a multimeter, this project should cost no more than about 50c since it consists simply of a single transistor, with no associated components "pepping up" the performance of the resistance range on a multimeter.

Lie detectors are not very accurate pieces of equipment but they do work in a vague sort of way using a very simple principle and they provide endless hours of fun. The principle of simple lie detectors is that the skin resistance of a person varies with changes of emotion. These changes can easily be measured and are surprisingly rapid especially when the emotion is fear.

Many readers will know that a reading of skin resistance can be obtained using the high resistance range on a multimeter simply by holding the probes, one in each hand. The actual resistance varies enormously — between about 20k and 300k but under most conditions the resistance is between 100k and 250k. Cheaper multimeters will certainly show a reading for this sort of resistance but it will almost certainly be at the extreme end of the scale and to observe changes of about 5 per cent is very hard.

It is however very easy to increase the sensitivity of the meter just by connecting a transistor's collector and emitter to the meter and taking the probes from the base and collector. The battery inside the meter (1.5V in most cases with additional 9V or 15V ones in the better types) provides the supply voltage and it will quickly be seen from Fig 3 that a very high resistance in the base-collector circuit of the transistor

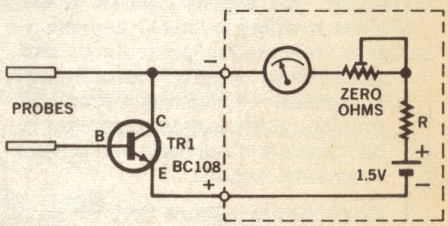


Fig 3. The lie detector circuit. The components within the dotted line are those in the multimeter itself when switched to a resistance range.

brings about a greater current flow through the meter and thus effectively registers a lower resistance.

Note that the positive connection to a meter is actually the negative connection to the battery and so the connections to the transistor are made in what appears to be the wrong way around.

A silicon NPN transistor should be used (so here the meter positive lead goes to the

emitter) and a 2N2926, BC109 or BC108, or any similar type is ideal. These transistors have very low leakage and very high gain and will bring the meter reading to the centre portion of the scale.

The same circuit is also applicable for measuring very high resistances or checking insulation. Using the circuit shown most meters will give a decent reading for 20M — something quite outside their normal scope. Your scale will of course bear no relationship to the resistance being measured but it is a relatively easy matter to plot points on a graph using known resistances for calibration.

The transistor itself should be mounted on solder tags fixed to a small panel of perspex or polythene. The resistance of wood or similar sorts of material will upset the readings. The hand held probes can be made from brass or copper rod and when used these should be firmly held.

The use of the lie detector can be very amusing and provide hours of fun at parties. There is an admirable solution to the inevitable sceptic who mocks the test — pour your drink over his hands! The surprise itself should be enough to produce the reaction but what he will probably not know is that the liquid will improve the probe contact and increase the reading. (Use water with little salt in for this emergency measure — it looks quite like gin or vodka and after all you don't want to waste your drink do you!)

Two-transistor Radios

From the letters we receive it would seem that there are thousands of readers continually constructing simple radios using one, two or three transistors. I can well understand these people since I belong in their ranks and must have built over 50 of these in various sizes and to different designs in the last few years.

I make no apology for describing two more radios. A one transistor and a three transistor design have already been described in May, 1972 and July, 1972, respectively. The first circuit described here is particularly suitable for miniaturisation and although no direct constructional details are given, several comments are made later regarding component choice etc.

The problem with many published designs is that to achieve the high gains necessary for such sets very accurate biasing etc is required, and since transistors have appreciable spreads in their characteristics the published circuits will only work well with ones used in the prototype. The circuit shown here (in Fig. 4) has been thoroughly tested and over 30 transistors were tried. All worked well and only one resistance has to be chosen with care for the complete circuit to be sensitive and stable.

The supply voltage can vary between 3V and 15V with no circuit modifications though performance is, of course, better using the higher supply voltages. The circuit has very high gain and so the ferrite rod aerial — which is a problem when miniaturisation is the aim — can be very small. The prototype uses a 1½in x ⅜in size cut from a longer length.

VC1, L1 and C1 comprise the tuned circuit and the overwind on L1 auto-transforms the RF picked up and feeds this to the base of Tr1. The collector of Tr1 is connected directly to the base of Tr2 whose emitter

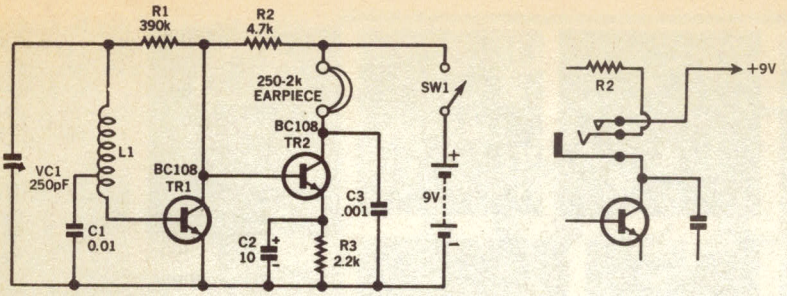


Fig 4. The circuit of the first two-transistor radio. If the jack socket is connected as shown a switch is unnecessary.

voltage is raised to the necessary level by R3 smoothed by C2. Detection takes place in Tr2 and the rectified RF is smoothed by C3 connected between the negative and the collector of Tr2. R2 acts as the collector load of Tr1 and provides the bias for Tr2.

The base bias for Tr1 is provided by R1 which is connected through the aerial coil. This gives a measure of regeneration to the first stage and has the advantage over capacitively coupled feedback in that it is not frequency selective and gives smooth regeneration over the complete MW band. It is this resistor that has to be chosen with care. Stray capacitance will contribute to the regenerative process and so the value will depend not only on the actual transistor used but on the physical layout. The values in the prototypes varied between 56k and 1M.

The earpiece used should be a high impedance magnetic type between 250-ohms and 2k. These earpieces seem to be fairly widely available (they're all made in Japan of course) but if these are difficult to obtain in your area a crystal earpiece connected across a 3.3k resistor will work just as well.

The aerial rod is easily made and about 80 turns on a ⅜in ferrite rod tapped at 8 turns will do. Enamelled copper wire of almost any gauge will suffice.

The cheapest and smallest tuning capacitors are 250pF or 500pF trimmers and these are ideal for miniature radios. The 250pF is quite adequate for this set and using the aerial coil described above will give a coverage from about 600kHz to 1.5MHz.

The components can be mounted on Veroboard or on Paxolin sheet. The battery switch can easily be incorporated in the earphone socket by bending the contacts so that the jack socket makes rather than breaks the switch contacts. The finished set draws only about 1.5mA and so all resistors can be ⅛W types and the battery will last a long while.

Despite the fact that the previous circuit used two transistors, the similarity between the circuits stops there, for the second one is not only simpler but, in my opinion at least, it is rather better.

The function of any radio, whether it be a communications receiver or a simple little design of the type shown here, is to pick up the radio waves, amplify them, detect them and present them as usable information, which in the case of normal sets is in the form of sound waves. To pick up radio waves an aerial is required and to differentiate between the various frequencies (for an aerial will of course pick up all frequencies) a tuned circuit is needed.

In the design, shown in Fig. 5, the coil part of the tuned cirucit also acts as the aerial, the rest of the tuned circuit comprising VC1 and the 0.01uF capacitor. The radio frequencies appearing across the tuned circuit are coupled to the base of Tr1 and amplified by it. The amplified signal appears at the collector, R1 acting as the load and this is directly connected to the base of Tr2 which acts as an emitter follower.

Now the emitter "resistor" of Tr2 is a 2,000-ohm magnetic earpiece which has considerable inductance and RF signals will not pass through it, but the detector diode D1 will pass them and these are smoothed by the 0.01uF capacitor which also forms part of the tuned circuit so that audio frequency signals are presented to the base of Tr1.

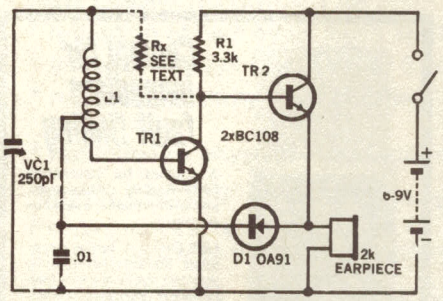


Fig 5. The complete circuit of the two-transistor reflex receiver.

The same amplification action takes place as for the RF signals but this time the inductance of the earpiece is far less effective at blocking the RF signals and so it is heard in the earpiece itself. Some of the AF does get through for a third trip but so little that it doesn't really matter.

DC base bias for Tr1 is taken from the emitter of Tr2 through D1. Depending on the characteristics of Tr1 and D1 an additional resistor Rx may improve the performance and indeed with some components may be essential. It's value will probably lie between 100k and 3.3M. In addition to helping with the base bias it will also introduce a certain amount of regeneration which will improve the performance. R3 is nominally 3.3k but values between 2.2k and 22k can be tried for best results.

Generally speaking I dislike reflex circuits (which of course this one is); they tend to be unstable, highly dependent on component values and poor value for money (the extra components usually cost more than an extra transistor) but in this circuit it works very well and none of the values are critical.

It must be emphasised that low impedance and crystal earpieces are not suitable for this type of circuit and only high impedance magnetic types will work at all.

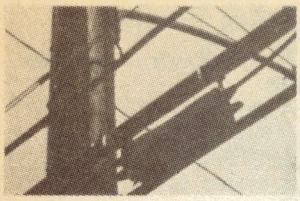
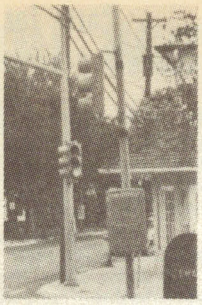
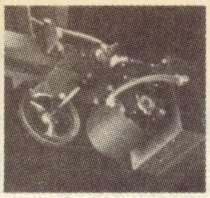
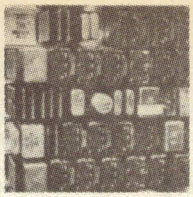
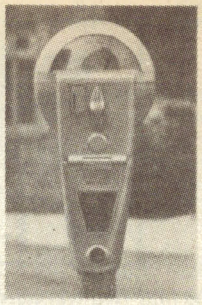
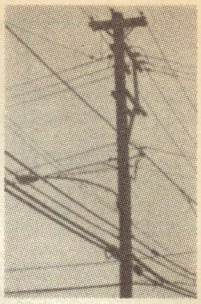
The coil L1 is the same as that used for the first radio. It consists of about 80 turns of enamelled copper wire wound on to a 3/8in diameter ferrite rod tapped at eight turns. The acutal gauge of wire used is not critical, but I usually use 36SWG size.

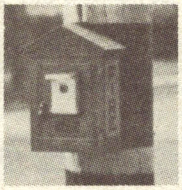
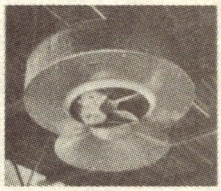
Parts for First Simple Radio

Resistors:
R1 390k — see text R3 2.2k
R2 4.7k
All ⅛th watt
Capacitors:
C1 0.01uF
C2 10uF 10V
C3 0.001uF
VC1 250pF trimmer
Transistors:
Tr1 Tr2 BC108
Miscellaneous:
L1 — see text
250-ohm or 2k magnetic earpiece — see text
miniature jack socket
4.5V-15V battery — see text.

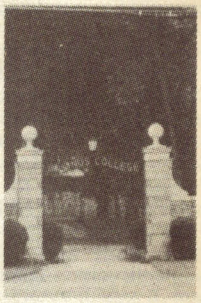
Parts for Reflex Receiver

R1 3.3k 10%, ¼ watt — see text
C1 0.01uF
VC1 250pF variable
L1 See text
D1 OA91 diode
Tr1 BC108
Tr2 BC108
Earpiece, 2k magnetic type
9V battery
On/off switch





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Control Centre for Amateurs

An easily built unit which provides a compact control centre for the more modest amateur station, or for field operation. It features a mic preamp with compression, facilities for mixing, recording, relaying and duplex, a modulation level meter, and relays for T-R switching.

by JAMIESON ROWE

Amateur radio equipment seems to have an innate tendency to proliferate. Even after a short time the new amateur is likely to find himself with a number of receivers, transmitters, modulators, microphones and other equipment, many of which may duplicate functions. This can be costly, and it can also be confusing: it is all too easy to switch on the wrong gear, or to start speaking into the wrong microphone!

Although my own station is a very modest one, I realised some 15 months ago that it was tending to move in this direction. The answer became clear: look ahead as much as possible, try to plan a system which should perform the functions ultimately required, using the minimum number of separate units, and build each unit with that system in mind. Like New Year resolutions, such schemes have a habit of being carried more in the breach than in the observance, but I have tried to stick with this one so far and it has worked out rather well.

One area which seemed very suitable for simplification was the mic preamp and pre-modulator. Instead of each transmitter and modulator having its own preamp, the logical idea seemed to be to have a single mic and preamp, with a distribution amplifier used to pipe it to any of the transmitters or modulators at will.

The more I thought about this idea, the more facilities I wanted to build in — like mixing, switching for duplex, and so on. It soon became clear that the unit was becoming a sort of audio control centre, and the logical thing to do was to combine the unit with the basic T-R switching of the station. Hence was born the unit described in this article, which is probably best described as a "mini control centre" for modest stations.

What does it include? For a start, there is the mic preamp. This is followed by a simple mixer circuit, which allows a choice of either the mic signals, the output of a tape recorder or the audio from the receiver (for relaying). The mixer is followed by a distribution amplifier which can feed the signals to two or more transmitters or modulators, and also to a tape recorder. There is a level meter circuit across the distribution amplifier output, to allow monitoring of the modulation level.

The unit also includes a 15-ohm loudspeaker, intended to become the speaker for the master receiver of the system, and relays whose contacts are available for receiver and transmitter switching, and switching of the supply for an aerial changeover relay.

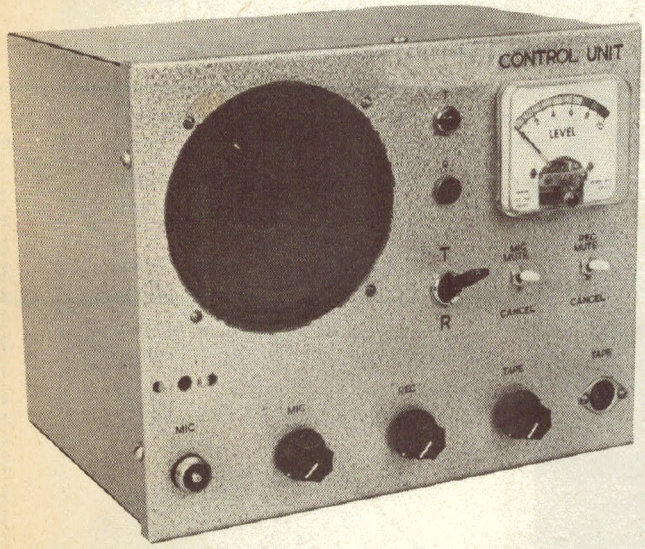
In short, the unit provides most of the facilities needed for a basic amateur station, other than the transmitters, receiver and aerials. And this all fits in a box measuring only 10 x 8 x 7in (255 x 205 x 180mm).

The compact size may also make it worthy of consideration by those amateurs who like operating out in the field. In fact it should be quite suitable for this purpose, as it could easily be adapted for battery power supply.

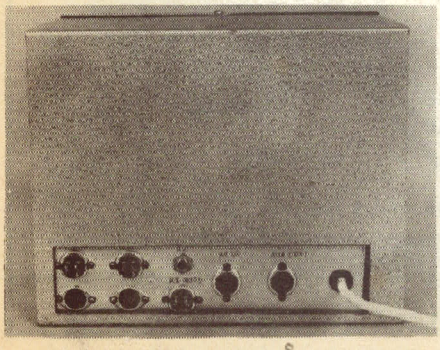
Radio amateurs are independent by nature, and are rarely known to build up published equipment designs in the form in which they are described. Therefore I do not expect that very many will wish to duplicate the unit as it stands, particularly as it was built up to suit my own specific needs. However I have decided to describe it here because at least some of the ideas which it incorporates seem likely to be of interest to other amateurs seeking to build up a unit of this general type.

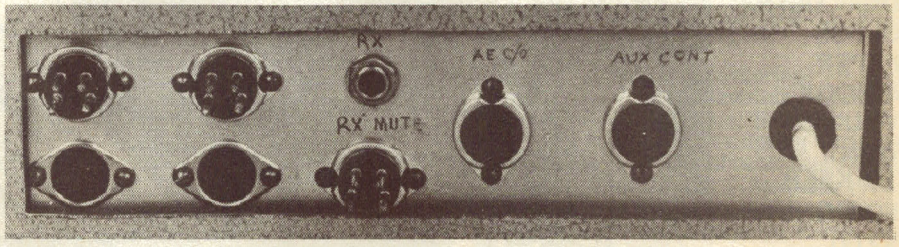
The main virtue I can perhaps claim for the unit in this particular form is that it has been in use now for about a year, and performs well.

The detailed design of the unit may be seen fairly easily from the circuit. The mic preamp may be familiar — it is actually the solid state compressor-preamp which was described in the February 1970 issue. This is an easily built unit, yet it performs well and gives good results with small AM and FM transmitters. It is based on a small printed

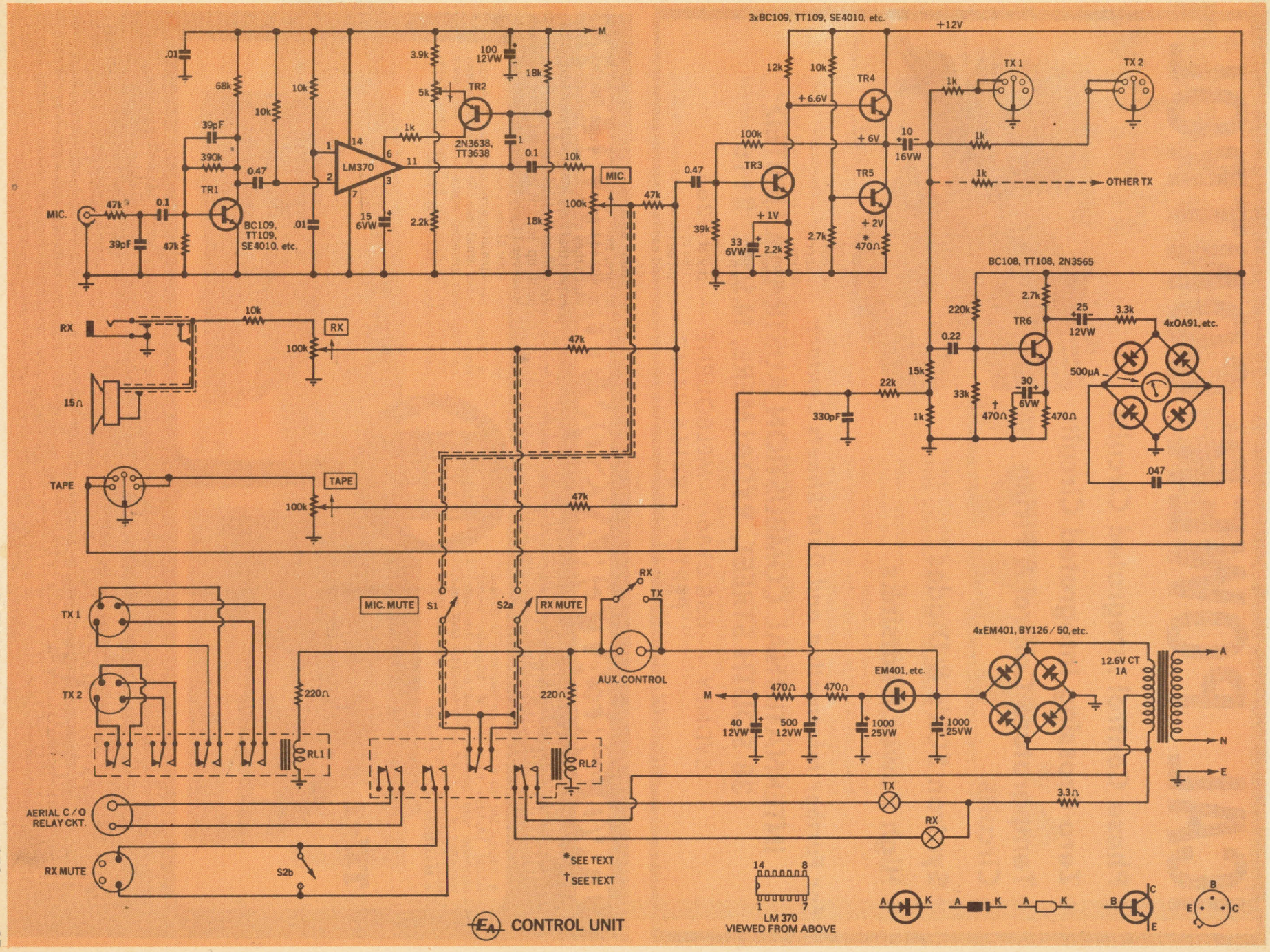


The compact control unit made by the author. The hole above the mic input socket is for screwdriver adjustment of compression level.





A rear view of the control unit (left) with a close-up of the various sockets (above). These are (from left to right) two plugs for transmitter switching with a socket under each for transmitter audio connectors, a jack for the speaker input, the receiver muting plug and sockets for the aerial changeover relay and auxiliary control.



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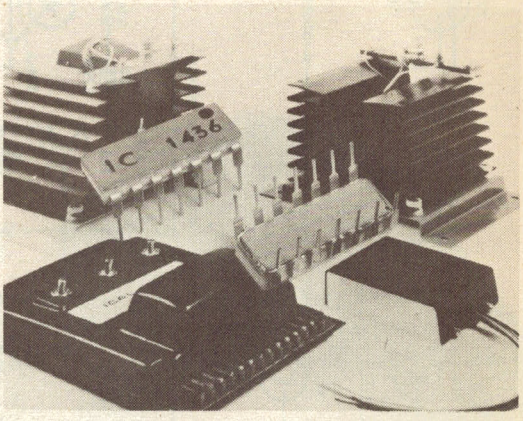

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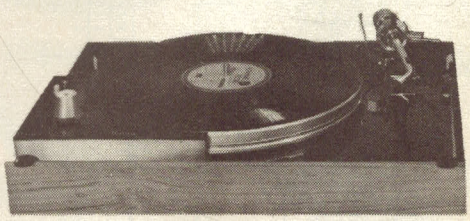

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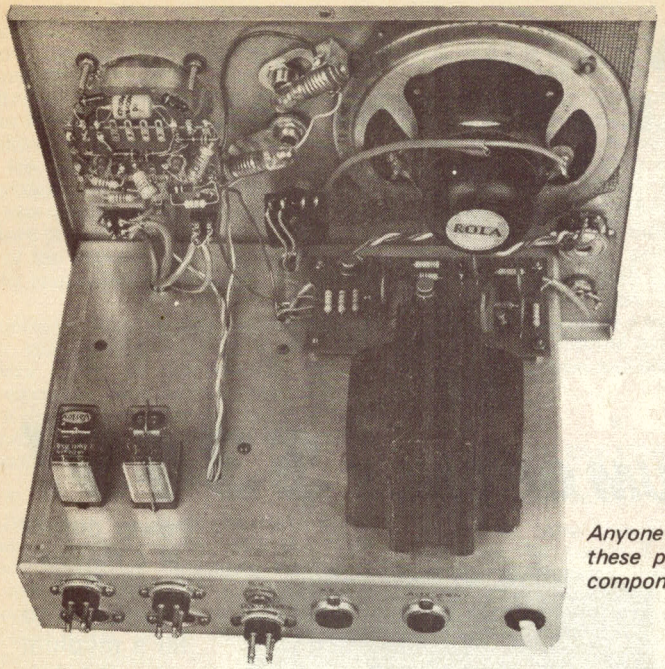
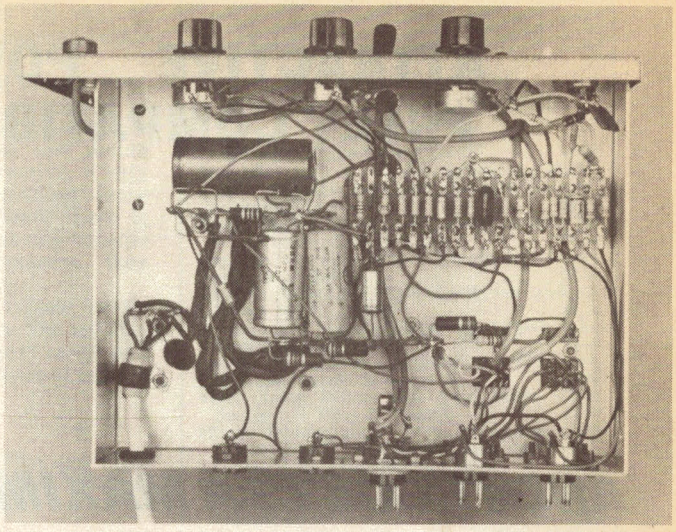




Anyone wishing to follow the author's layout should be able to do so from these photographs, used in conjunction with the diagrams showing the component layout on the tag-strip and printed wiring board.

wiring board, code number 70/pl.

The heart of the preamp is a fairly complex linear IC, the LM370 (NS Electronics Pty Ltd). When the preamp was originally described, and when I built the control unit up, the LM370 was available in TO-5 package form. This is the form of the device for which the wiring board was designed. However since then the device has only been made in a 14-lead dual in line (DIP) package, so that those wishing to build up the unit now using the board will need to perform minor surgery to adapt it for the new package. The connections for the DIP package are shown on the circuit for guidance.

The preamp has a control which sets the output level at which compression occurs. If desired the control can be set so that the compression is virtually disabled (fully clockwise position).

The output of the preamp is taken via a 10k isolating resistor to the mixing circuit, which consists of three 100k log pots whose outputs are combined via 47k adding resistors. The other mixer inputs are connected to the monitor speaker voice coil, again via a 10k isolating resistor, and the 5-pin DIN socket used for interconnection to a tape recorder.

The rotors of the "mic" and "Rx" pots are also connected to muting relay contacts, used to ensure that the mic is normally rendered inoperative during receive and the receiver during transmit. However the connections are made via series switches, which may be used to disable the muting when not required — in order to operate duplex, for example.

The output of the mixing circuit feeds to the distribution amplifier, which is a straightforward design using three BC109 or similar high gain silicon NPN transistors. The output of the distribution amplifier is then made available via 1k isolating resistors to 5-pin DIN sockets used for connection to the inputs of transmitters or modulators. It is also fed via a divider network and a low-pass filter (for RF suppression) to the tape recorder socket.

The nominal audio output level of the distribution amplifier is approximately 500mV, so that it should be possible to provide at least 250mV at the input of each transmitter providing it has an input impedance of 1k or more.

Although only two transmitter output sockets are shown, you can easily add further sockets if required to cope with more transmitters. Up to two additional sockets may be added simply by wiring them in with a 1k resistor in series with each. However if more outputs are required, it would be desirable to increase the quiescent current in the output transistors of the distribution amplifier to prevent distortion on peaks.

This can be done quite easily by reducing the emitter resistor of T5 from its present value of 470 ohms. For example a value of 220 ohms should allow the circuit to operate with up to eight outputs. But do not reduce the resistor value below about 150 ohms, or you may run into overdissipation problems. Note that the exact number of transmitters which can be connected to the unit for a given quiescent current, before distortion occurs, depends upon the input impedances of the transmitters. The lower the input impedances, the fewer the transmitters which can be connected, and vice-versa.

Also connected across the output of the distribution amplifier is the level metering circuit. This uses a simple one transistor amplifier stage with a BC108 or similar general purpose silicon NPN transistor, driving a bridge rectifier and a standard 1mA meter movement. I used a locally made meter movement I had on hand, but one of the cheaper imported types available nowadays would be quite adequate.

As shown, the gain of the meter amplifier stage is set so that the meter reads 0.8 of FSD for the nominal output level of 500mV at the output of the distribution amplifier. However it is an easy matter to change the gain if desired, to correspond to a different output level. This is achieved simply by altering the value of the resistor in series with the 30uF emitter bypass capacitor. Increasing the resistor from its present value of 470 ohms will reduce the gain, while reducing it will increase the gain.

The T-R switching functions performed by the unit are carried out using two miniature relays. The relays I used have coils with a resistance of around 250 ohms; one is an STC unit, type number 250-AKO, the other is an English "Varley" which is very similar. Both have four sets of changeover contacts.

The contacts of one relay (RL1) are used solely for transmitter switching. Those of the other relay (RL2) are used for receiver muting, switching current for the aerial changeover relay, mic and receiver muting, and operation of indicator lights. The relays are controlled by a toggle switch, which becomes the main "T-R" control of the station. However a socket is wired in parallel with the switch so that T-R switching may be controlled remotely if required. In my case this is convenient as one of my aerial changeover switches is a manual one, to which I have fitted contacts to act as the remote T-R switch.

The power supply for the control unit is very straightforward. It uses a 12.6V centre-tapped transformer, with a bridge rectifier using EM401 or BY126/50 or similar 1A diodes. The indicator lamps are fed with AC, which is taken directly from the transformer via connections to the centre-tap and one end of the winding.

Power for the relays is taken directly from the output of the rectifier bridge, where a 1000uF electro is used as a reservoir. As the voltage at the bridge output is approximately 17V, 220 ohm resistors are used in series with each relay coil to limit the current to a value adequate for reliable operation.

The 12V required by the transistors and IC are derived from the bridge output via a series diode and RC decoupling networks. The series diode is used to ensure that the relay coils do not significantly drop the voltage fed to the transistors.

As noted earlier, the unit is housed in a case measuring 10 x 8 x 7 inches. This is a standard instrument-type case having a flanged front panel; my case was obtained from Heating Systems Pty Ltd, but other manufacturers would have similar types.

The layout of the front panel may be seen from the photograph, and should

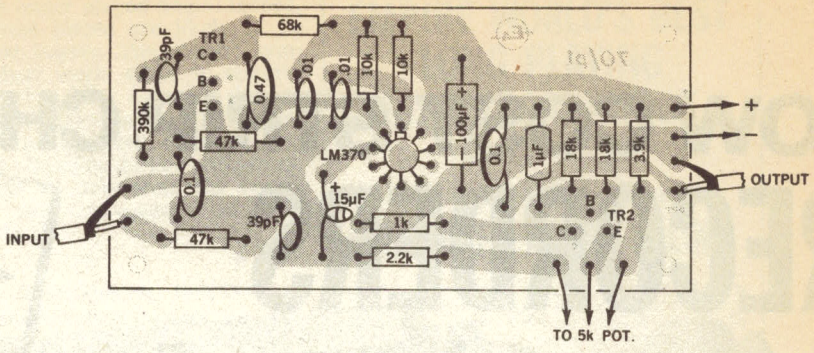
be fairly self-explanatory. The pot used for adjustment of compression level is a tab type, and is mounted above the mic input socket for convenient screwdriver adjustment. The two small switches below the level meter are S1 and S2, used for cancelling the mic and receiver muting when desired. Note that S2 has two poles, one of which (S2b) defeats the action of the relay contacts which normally break the receiver supply line during transmit.

A sturdy heavy-duty toggle switch having a relatively large lever is used for the main T-R control, for convenient and reliable operation. Above it are the two indicator lamps, that for receive having a green bezel while that for transmit has a red bezel.

With the exception of the mic input socket and the tape connector, all of the connectors of the unit are mounted on the rear apron of the chassis, a suitable clearance cutout being provided in the rear of the case. I have used 5-pin DIN sockets for the transmitter audio connectors, a phone jack for the speaker input, polarised two-pin sockets for the auxiliary control socket and the aerial changeover relay switching socket, and chassis-mounting 4-pin plugs for the transmitter switching and receiver switching connectors. The use of plugs for the latter obviates the risk of shock or accidental shorts.

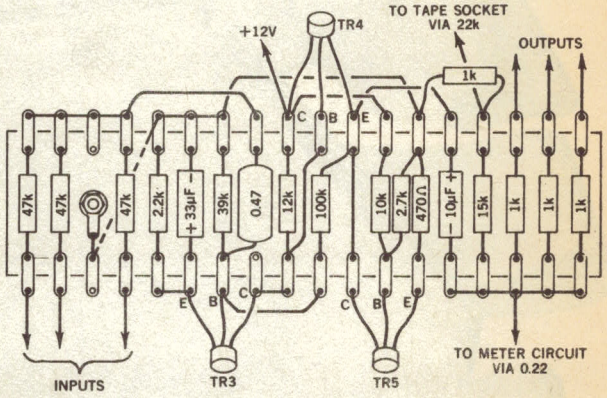
The layout of the unit is not particularly critical, and that of my own unit was chosen mainly to suit the components on hand. The preamp board, power transformer and relays were mounted above the chassis, with the remaining wiring beneath except for the metering amplifier stage. This is mounted on a small section of miniature resistor panel attached to the meter itself via the terminal screws.

The distribution amplifier wiring is mounted on a second section of miniature resistor panel. A diagram showing the placement of parts and wiring on this panel is shown on these pages for those who may care to copy it. The remaining wiring is supported on a few small tagstrips, as may be seen from the photographs.



(Above.) The component layout and printed wiring diagram for the preamp.

(Right.) The layout of the components on the main tagstrip under the chassis of the control unit.



Note that the 330pF capacitor across the tape output and the .047uF across the meter movement are for RF suppression. To keep RF from straying into the case I also used a piece of bronze fly-screen mesh as the speaker "cloth", and made sure that it was earthed.

Before concluding, it may be worthwhile to give brief details of the modifications which would be required in order to use the control unit for field operation. Basically this would only involve changing the power supply system so that everything operates off one or more 12V batteries.

If a 12V accumulator is to be used as the source of power it should be quite sufficient to connect it into circuit across what is at present the second 1000uF filter electro, substituting for the transformer, rectifier bridge, first electro and isolating diode. It would of course be necessary to change the indicator lamp wiring so that the lamps are also fed from the battery, but via a resistor of around 18 ohms (3W) instead of the present 3.3 ohms. The only other change would be to reduce the value of the resistors in series with the relay coils, in order to ensure reliable operation from the lower voltage. A value of 100 ohms should be satisfactory in most cases.

To operate the unit from dry batteries, the modifications needed would be very similar. However in this case it would be desirable to use two separate batteries. A heavy-duty 6V unit of the type intended for hand lanterns could be used for the indicator lamps and the relays (with the series resistors omitted), while a smaller 12V type could be used for the transistors. Again it would be fed in across what is at present the second 1000uF filter electro.

PARTS REQUIRED

1 Metal case, 10in x 8in x 7in or similar, with matching chassis.
1 Power transformer, 12.6V CT at 1A
1 Level meter, 500uA, 3in rectangular.
1 Loudspeaker, 15 ohms 5-inch diameter.
2 Relays, STC type 250-AKO or similar
1 Printed board, code 70/pl.

SEMICONDUCTORS

1 BC108,TT108, 2N3565 or similar.
4 BC109,TT109, SE4010 or similar
1 2N3638, TT3638, TT608, or similar
1 LM370 microcircuit.
5 EM401, BY126/50 or similar.
4 OA91 or similar.

RESISTORS (½watt, 5%)

1 x 3.3 ohms, 2 x 220 ohm, 5 x 470 ohm, 4 x 1k, 2 x 2.2k, 2 x 2.7k, 1 x 3.3k, 1 x 3.9k, 5 x 10k, 1 x 12k, 1 x 15k, 2 x 18k, 1 x 22k, 1 x 33k, 2 x 39k, 4 x 47k, 1 x 68k, 1 x 100k, 1 x 220k, 1 x 390k.
1 x 5k linear tab pot.
3 x 100k log pots.

CAPACITORS

2 x 39pF ceramic
1 x 330pF ceramic
2 x .01uF ceramic
1 x .047uF 160V polyester
2 x 0.1uF 100V polyester
1 x 0.22uF 100V polyester
2 x 0.47uF 25V ceramic
1 x 1.0uF 100V polyester
1 x 10uF 10VW electro.
1 x 15uF 6VW tantalum.
1 x 25uF 12VW electro.
2 x 30uF 6VW electro.
1 x 40uF 12VW electro.
1 x 100uF 12VW electro.
1 x 500uF 12VW electro.
2 x 1000uF 18VW electro.

MISCELLANEOUS

2 x miniature toggle switches, one SPST, one DPST: 1 x heavy-duty SPST toggle switch; 2 x indicator lamps, 6V incandescent type; 3 x knobs; 3 x 5-pin DIN sockets; 3 x chassis-mounting 4-pin plugs; 2 x polarised 2-pin sockets; 1 x mic socket; 1 x phone jack; 1 x 18-lug section of miniature resistor panel; sundry tagstrips, etc; mains cord and plug; scrap of metal screen material for speaker opening; screws, nuts, solder, etc.

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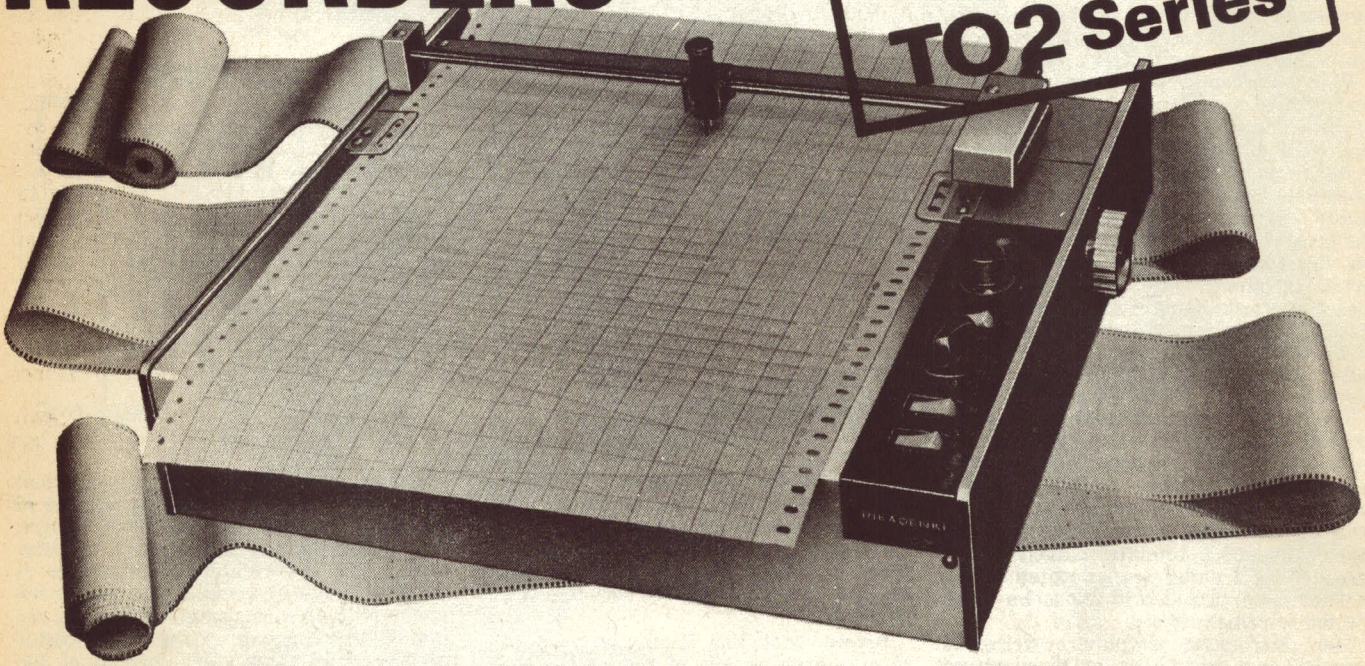

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Multi-Band Vertical Aerials

In last month's issue we gave details of a vertical aerial for the 14MHz amateur band which had been developed in the US. In this article the author describes two somewhat more flexible multi-band vertical aerial systems which he has developed locally and found to give good results, both for short-wave listening and for amateur transmission.

by IAN POGSON

Aerials for short wave use are many and varied. The variations are generally dictated by a number of factors, some of which are the frequency of operation, cost, simplicity or otherwise of construction, ease of erection, directivity required, amount of real estate available, and so on.

The factors to be considered will also vary according to the user. A short wave listener will possibly need an aerial, or aerials, for many bands according to his particular interest. These aerials will generally be required to respond to signals ideally from all directions. On the other hand, a transmitting amateur would have quite a different set of requirements. His aerial system would more than likely centre around the frequencies allocated to the Amateur Service. In addition, he would probably require some sort of directivity characteristics, either fixed or rotatable. Angle of radiation would also be of interest to the amateur. These are just a few of the possible considerations.

The above points are mentioned in passing, as being of general interest. No active radio amateur would need to be told any of these factors, as he has possibly spent quite a lot of time and effort in determining the best aerial system to suit his requirements. The writer can be listed with this group, having spent many years looking for an aerial system to meet his particular needs.

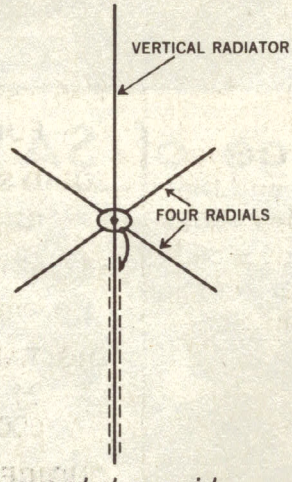
We have no intention of entering into any controversy as to which is the "best" aerial for amateur use, particularly the quad versus the Yagi!! In the opinion of the writer, they are both excellent systems, when properly used.

The writer has a two-section crank-up tower 50 feet high, and the need has been for aerials for the 3.5, 7, 14, 21 and 28MHz bands. We will forget about the two lower frequencies for the present and concentrate on the three higher bands. Over the years, many different types of aerial have been tried, all more or less satisfactory from the radiation point of view. The problem has been associated with the means of rotation.

A disposals type cowl gill motor has been used and is quite capable of doing the job. The real problem lies in the means of coupling the motor drive shaft to the shaft of the aerial to be rotated. The requirement here is always very stringent, as the coupling has to stand up to the high torque which strong winds impose from time to time. Other amateurs no doubt have had similar experiences and may well be looking for a way out.

Short of spending quite a lot of money etc., a solution seemed to lie in some sort of compromise with the situation. After much thought on the subject, consideration was given to the possibility of trying a ground plane. This aerial is relatively simple to make, has a low angle of radiation and as it is omni-directional, dispenses with the need for any rotating device. Points which may not be in its favour are the fact that it does not beam the signal in any particular direction, with its implications. Vertical aerials also have a reputation for picking up somewhat more noise than a horizontal system. Also, under some circumstances, problems with BCI and TVI can be experienced.

The pros and cons were weighed up and



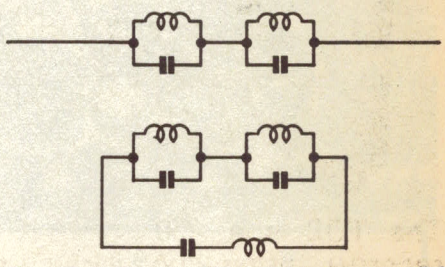
A basic ground plane aerial.

we decided to "give it a go". Initially, we roughed up a simple unit, similar to the basic ground plane as shown in the sketch. Each of the four radials and the vertical section were made of 1in diameter duralumin tubing, 13ft 6in long. Details of the actual construction will be given later on.

With the four radials actually on the ground, we connected a coaxial cable with the braid to the radials and the inner conductor to the vertical element. The cable, about 50ft long, was connected to a full coverage receiver. In case you were wondering, the aerial in this form resonated at about 16MHz. A listening test was very encouraging. Strong signals were received over a wide range of frequencies. These included international broadcast stations on frequencies between about 7MHz and 21MHz, together with amateur signals on the three bands included in the same frequency range. On 14MHz in particular, amateur signals were excellent from interstate as well as overseas, including British and European.

Listening over a period of a couple of weeks showed that this was an aerial which would be ideal for many short wave listeners. Naturally, the performance would be best around the resonant frequency of 16MHz but results showed that it is quite satisfactory over at least the frequency range originally quoted and if some fall off in response can be tolerated, it can be used right down to the broadcast band. In point of fact, a fortunate situation exists here, in that most receivers are more sensitive on the lower frequencies and so they do not need such an efficient aerial as for higher frequencies.

Within the limits which we have already quoted, we can confidently recommend this



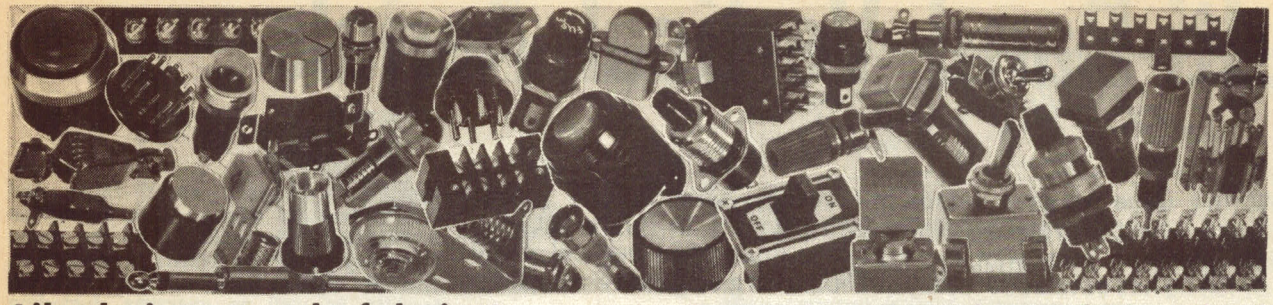
Top. A half-wave dipole with two parallel resonant circuits in series inserted at the centre. Above. The equivalent circuit, which is resonant at three different frequencies and no others.

simple ground plane aerial to short wave listeners who may not have the space or other facilities for something more ambitious.

Our findings thus far were such that we were encouraged to develop this aerial for use as a transmitting and receiving aerial for the top three HF amateur bands. What was required then was some means of making this aerial resonant on 14, 21 and 28MHz, together with a method of feed which meets the requirement of a low SWR.

For many years the writer has made use of the multi-band aerial tuning system as developed by Hans Ruckert, VK2AOU. Briefly, this system consists of splitting a dipole and inserting one or two parallel or series resonant circuits between the two halves.

It can be shown that a resonant half wave dipole is equivalent to a series resonant circuit at the same frequency. Also, let us consider that we have two parallel resonant circuits, in series, connected into the centre of the dipole. Again, it can be shown mathematically, that this is equivalent to two parallel resonant circuits in series, with a series resonant circuit connected across them and that the system is resonant at three different frequencies, not necessarily harmonically related.



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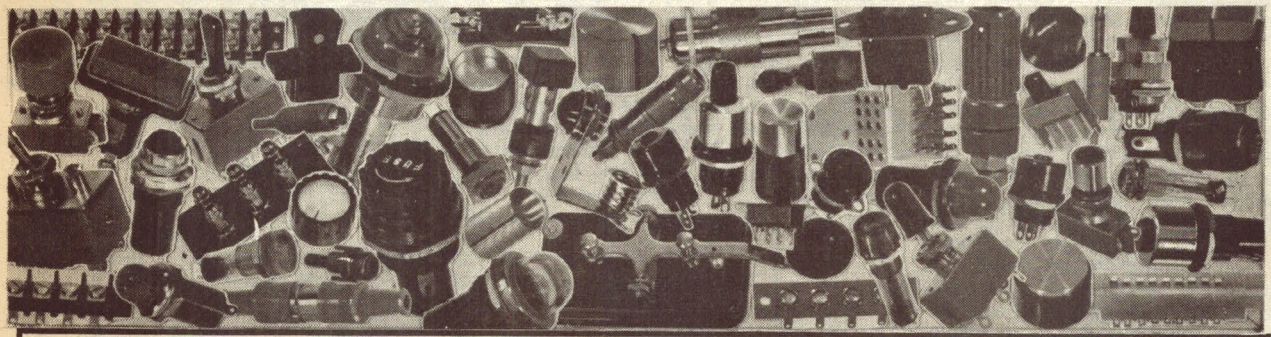

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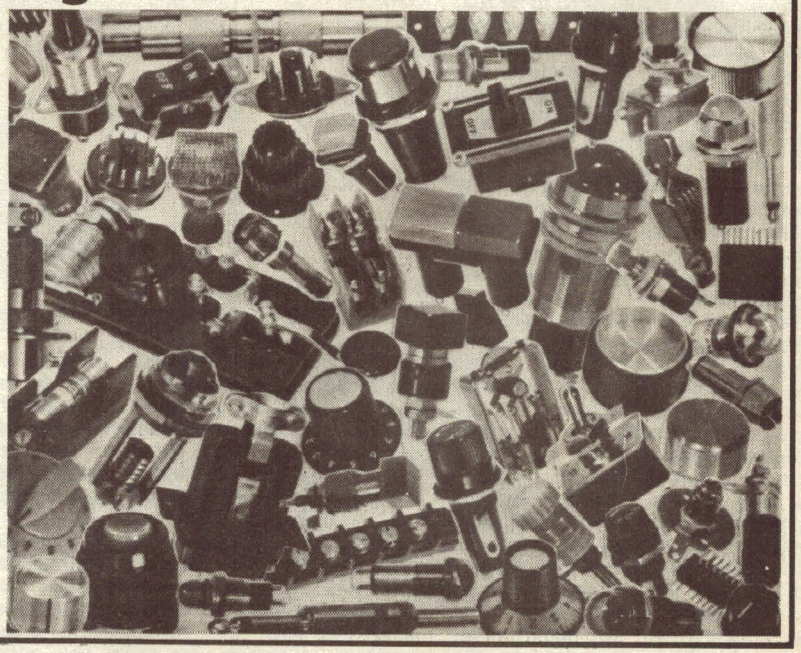

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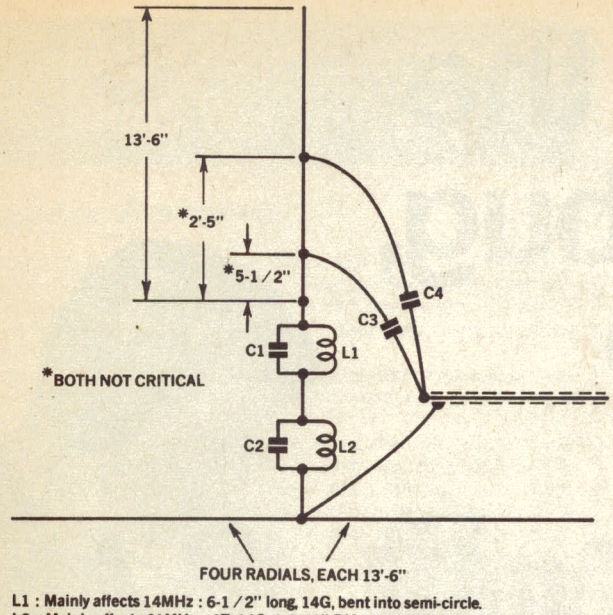
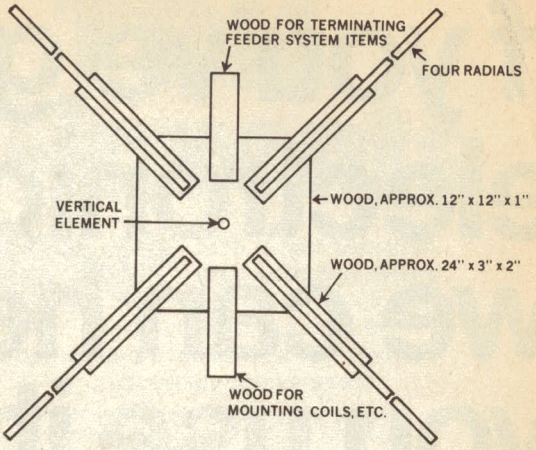


L1 : Mainly affects 14MHz : 6-1/2" long, 14G, bent into semi-circle.
L2 : Mainly affects 21MHz : 2T, 14G, 1-1/2" DIA., 1/2" long, leads 2" and 4" long.
C1 : Mainly affects 21MHz : 160pF.
C2 : Mainly affects 28MHz : 60pF.
C3 : Mainly affects 28MHz : 55pF (Adjustment fairly critical).
C4 : Mainly affects 14MHz and 21MHz : 52pF (Adjustment fairly broad).

Note: Space gamma 2" from radiator, to 2'-5" tap, otherwise SWR on 28MHz will be seriously affected.

The circuit of the aerial system for the 14, 21 and 28MHz bands.



(Above.) The layout of the base constructed by the author to support the vertical element and the four radials for the aerial system covering the 14, 21 and 28MHz bands.

A very interesting exercise is to mock up an arrangement using two equal lengths of wire, strung horizontally and broken in the centre. Add two parallel resonant circuits as shown and then investigate it with a grid dip oscillator. Couple the GDO into each of the coils in turn, and you will find three resonances. It is also interesting and important to note that this system will not resonate at any other than the above frequencies. This is a useful feature, in that it helps to reduce harmonic radiation. For readers who wish to read more on the findings of Ruckert, a list of references is given at the end of this article.

In order to apply this tuning system to our ground plane, we have to insert the two parallel circuits between the ground planes and the vertical element. This is shown schematically in the appropriate diagram. By now many readers will be asking how the three wanted resonances are obtained. The answer in general terms is that 14MHz is largely determined by L1, 21MHz by both C1 and L2, and 28MHz by C2. If you stick to the element lengths which we have used, then the values of L and C may be obtained from those we quote. Otherwise, you will have the interesting task of finding them for yourself.

It may be noticed that the element lengths used fall between a half wave on 14MHz and a half wave on 21MHz. This means that the system is shortened for 14MHz, somewhat lengthened for 21MHz and rather longer again for 28MHz. From practical considerations, the element lengths which we have used are about the longest for the frequencies involved, whereas the radials and the vertical radiator could possibly be reduced to a lower limit of 11 feet. This may lead to some drop in overall efficiency and it would certainly mean a new set of values for L1, L2, C1 and C2.

Having arrived at a set of values for the two capacitors and two inductors, by means of a grid dip oscillator, the next move is to find a satisfactory means of feeding the system on all three bands. This can be done by means of a link coupling arrangement into one or both of the inductors. However, a method which we found to be very satisfactory closely resembles the familiar "gamma" match.

The feedline used is 75 ohm coaxial cable, with the braid terminated at the junction of the four radials. From the centre conductor, a lead is taken via a capacitor to a tap 2ft 5in up the vertical element. This serves for both 14Mhz and 21MHz. For 28MHz, another lead is taken via a capacitor, to a tap 5½in up the vertical element. This arrangement can be adjusted to give a low SWR on all bands. The values which we found to be optimum again apply only when the same element lengths are used. No doubt these adjustments will have to be modified if shorter elements are used.

From a constructional point of view, it may be better to leave most of this to the devices of the individual. At the same time, a few remarks as to how we went about it may be of assistance.

Whereas we used 1in OD dual tubing, with radials and vertical element each 13ft 6in long, other materials and diameter may be used according to individual needs and circumstances. We would suggest however, that the original element lengths be adhered to, unless there is a good reason for making a change.

Our construction was based on a "chassis" consisting primarily of a piece of board, about 1ft square and 1in thick. Four pieces of 3in x 1in about 2ft long were added to the board, as shown in the sketch. These are to provide a fixing for each of the radials, the radials being held in place with two saddles for each. In addition to the four pieces of 3in x 1in just mentioned, we added an extra two pieces as shown, about 1 ft long. These are handy to accommodate stand-offs, terminations, etc, for the tuning items and the feeder system.

Having fixed the radials in place, the question of fixing the vertical element can pose some problems. We screwed a stand-off ceramic insulator to the centre of the board, the diameter of the insulator being such that it was an easy fit inside the end of the tubing. The vertical element was then stabilised by using four guys, one to each of the radials. We used stranded galvanised wire for the radials, broken by egg insulators about 2ft apart. A point about 4ft up the vertical and about the same distance along the radials from the centre would be satisfactory. In the construction, we made use of clamps intended for TV aerial use.

Inductor details, capacitor values, method of feeding, may all be obtained from the table and drawings. Most of this information should be self-explanatory and the small details are left to the initiative and particular requirements of the individual.

It will be noted from the inductor details that L1 is not a coil but a short length of wire, bent into a semi-circle. This may need a bit of juggling to get the 14MHz response correct, but no trouble need be anticipated. It would seem that this inductor virtually determines the maximum length of the vertical and radial elements. If they are increased beyond the length which we have used, then this inductor would approach vanishing point. On the other hand, with shorter elements, this inductor will increase and will then assume the shape of a coil.

All of the capacitors, C1, C2, C3 and C4, which we used, are of the miniature variable type. When they have been adjusted, each one is put into a protective plastic container, to protect it from the weather. The containers which we used were originally used for pharmaceutical products, such as tablets, etc. These are not hard to come by. In each case, we drilled two small holes in the case to pass the leads through, these holes were waterproofed later by a drop of Bostik or similar adhesive.

Although we used miniature variable capacitors in the finished job, it may be possible to use coax cable, to give the requisite capacitance, once it has been finally determined with a variable capacitor. This may be worth investigating.

The capacitors C3 and C4 are mounted close to the end of the coax feedline. The lead from C3 should be a heavy gauge of wire and is run directly to the tap point which is only 5½in up the vertical element.

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This point did not appear to be critical. Much greater care must be taken with the lead from C4, to its tap 2ft 5in up the vertical element. Steps must be taken to run this lead parallel with the vertical element, starting from an inch or two from the bottom. The distance of the lead from the element is necessarily a compromise, as the closer it is the better, for 14Mhz; but it should be spaced at least ¾in for 28MHz.

In fact we found that ¾in spacing was about the best compromise. If the spacing is too little, it will be impossible to get the SWR down for 28MHz. Following from this condition, it is necessary to maintain the spacing constant against weather conditions and to this end, spacers must be provided to achieve this. Although we used wire, which needs to be supported, it may be a proposition to use a small diameter tube, which would be rigid enough, when supported only at each end.

Having completed the assembly, with L1, L2, C1 and C2 connected up, the feed components are best left off at this stage. C1 and C2 are then set to approximately the capacitance given in the table. We will also assume that the radials are at least 12in or so above the ground. With a grid dip oscillator, couple into L1 or L2, the latter will probably be more convenient, check for the three resonance frequencies. While there will be a certain amount of interaction, L1 is varied to set the 14MHz point, both L2 and C1 may be varied to set the 21MHz point and C2 will control mainly the 28MHz point.

Even at this stage, the precise band-centre frequency should be aimed at in each case. Actually, such centre frequencies as 14.2MHz, 21.3MHz and 28.6MHz may be selected. Having done this, the feeder components are added and the series capacitors are set roughly to the values given in the table. These are simply quoted as a guide. We can now start the serious business of setting the centre frequencies accurately, together with adjusting the SWR to a minimum for each band.

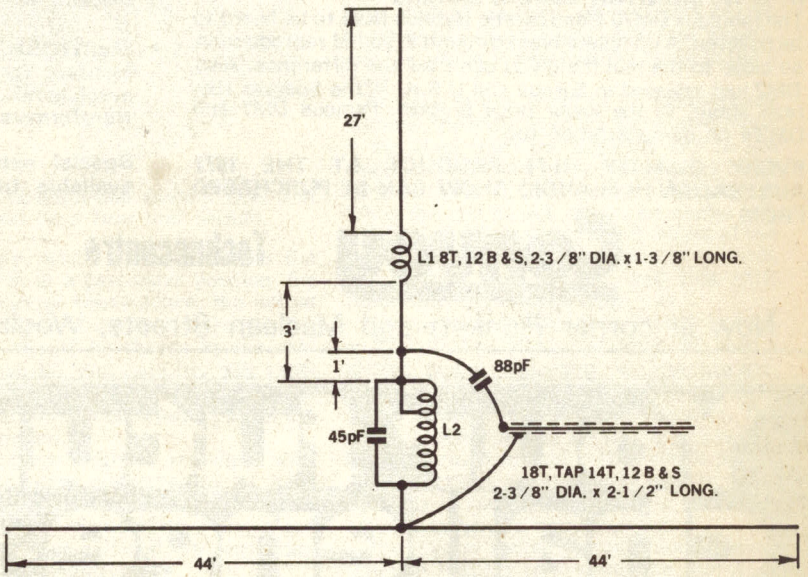
To do this, we need an SWR bridge and a transmitter set to deliver only enough power to actuate the bridge properly. A power input of about 20 watts or so should be sufficient. The bridge is connected in series with the line, as closely as possible to the feed point at the aerial, ie, within about 3 feet. The transmitter is then set to the desired centre frequency in the 14MHz band and a small amount of power loaded into the feedline. The SWR bridge will quickly tell its own story and this will indicate what has to be done to improve matters.

With the SWR bridge set for reflected power, check for centre frequency by introducing a piece of ferrite aerial rod into L2. If the meter drops, then L1 may need to be increased. Conversely, the opposite would be true. But at this stage, it would be well to leave L1 alone and attempt to reduce the meter reading by adjusting C4 for minimum.

The transmitter is now set to the chosen centre frequency in the 21MHz band and loaded up as before. Check the SWR again and attempt to bring the reading down by adjusting precisely to frequency with C1. This should bring the SWR to a very low value and although the SWR on this band is also largely determined by adjustment of C4, the adjustment already carried out for 14MHz should be very close.

The transmitter is again changed and set to the centre frequency for the 28MHz band and loaded up lightly once again. Adjust precisely to frequency with minimum reading, by C2. A further reduction in SWR is now effected by adjusting C3 and this should also result in a very low SWR. However, as intimated earlier, there is a compromise here between 14MHz and 28MHz and a complete reduction to zero reading may not be achieved.

With these preliminary adjustments made, we are now faced with a similar situation to that used for aligning a superhet receiver. The whole procedure must be repeated for each band, until all adjustments are correct. On the second time around, it may be determined whether L1 and L2 will need any adjustment. Adjustment of L1 is clearly indicated at this stage, if the frequency of the 14MHz band needs to be changed one way or the other. Adjustment of L2 will only be necessary if the 21MHz band can only be adjusted with C1, thereby markedly upsetting either of the other two bands.



A ground plane aerial system for 3.5 and 7MHz.

Having completed all adjustments, full power may be fed into the system. Even with the aerial about 12in above ground, it is remarkable just how well it performed at the writer's location. Although is was difficult to judge performance at this level, compared with the aerial raised to 28ft above ground, there did not seem to be a great deal in it, at least on listening tests. Even with the radials at 50ft above ground, little difference could be detected. In short, it would seem that the low angle of radiation for which the ground plane is reputed, is virtually unchanged by height above actual ground. At the same time, it is axiomatic that any aerial system should be well in the clear of all obstacles which could result in absorption of the signal.

The writer is also of the opinion that when a ground plane in particular, is raised as high as possible, the amount of noise pickup could well be reduced and any tendency to a strong ground wave which may be conducive to TVI and BCI, would be substantially reduced.

Since the tri-band ground plane has been erected at the writer's location, it has survived a very strong southerly blow at the 28ft level, showing no signs of distress. At the same time, considerable damage was done to property elsewhere. The performance of the aerial has been very satisfying, with good signal reports given by stations as far away as England and Europe. At the same time, we would not presume to compare it under poor conditions, with a high gain system. In spite of any shortcomings which such a simple aerial system may have we think that it has been worthwhile and we have no hesitation in commending it to those whose interests are in this direction.

Having had considerable success with the 14MHz, 21MHz and 28MHz amateur band ground plane aerial system we thought that it would be worth a try to produce a similar system for 7MHz and 3.5MHz, particularly as we had a use for such a system. Most of us have the usual suburban building lot and this does not allow sufficient room to erect a full size aerial for 3.5MHz. Even one for 7MHz can be somewhat of a squeeze.

Surely no one would dispute the efficiency and desirability of a full size aerial, even some sort of beam but for those of us who find this to be quite impractical, we must look elsewhere for an answer to the problem. As surprisingly good results are obtained with vertical whip aerials in mobile work, even on the 3.5MHz band, we reasoned that at least as good results could be obtained from a fixed vertical aerial system.

With these thoughts, we considered that it would be worth starting off with just two radials and see how this worked out. A suitable length for these radials would be somewhere between a quarter wavelength on 3.5MHz and 7MHz, or between 67ft and 33ft. We chose a starting length of 44ft as being about right to fit into the space we had available.

Turning to the vertical element details, we already had on hand a 20ft length of 3in x 2in oregon timber. Also, a piece of galvanised conduit, 5 / 8in diameter and 11ft 6in long was available. The conduit was clamped to the top of the timber, with about 18in overlap. Wire could then be run from the conduit down to the bottom of the pole, thus giving a vertical length of about 30ft. The pole was then pushed up and screwed to a selected post — actually part of a side

paling fence. In my case, this is all that was necessary to make a solid fixing for the pole. In some cases, it may be necessary to guy the pole, with guys suitably broken up with insulators.

From the base of the pole, we tacked one of the radial wires along the bottom rail of the fence. When fixing the second radial, we came to the corner at the back of the building block and so the radial was simply tacked for the rest of its length, along the bottom rail of the back fence.

With the three elements in place, the next job was to make a resonant system. As the radials were each 44ft long and the vertical element was only about 30ft, we decided that to make a reasonably balanced system, this element should be loaded to bring it to about an equivalent of 44ft. As shown in the diagram, this has been done by introducing a loading coil L1 at a point 3ft from the bottom.

This coil consists of 8 turns of 12 B&S enamelled wire, 2⅜in diameter and 1¾in long. We wound ours on "air" but if you have a suitable former, it could be used, provided that it is of low loss material and proofed against the weather. Two porcelain stand-off insulators were used to mount the coil. In fact, we used several of these insulators for terminations, at such points as the bottom of the vertical section, which is just a few inches above the ground level.

The 27ft length between the bottom of the conduit and the loading coil is provided with a reasonably heavy gauge of copper wire, say between about 12 and 16 gauge. The 3ft space between the coil and the bottom end of the vertical element is also a piece of the same gauge of wire.

Assuming now that the vertical element and the radials are in position, the next task is to tune the system to the 3.5MHz and 7MHz bands. Another coil is required (L2) and the one which we used consisted of 18 turns of 12 B&S enamelled wire, wound on a 2⅜in diameter ceramic ribbed former, the winding being 2½in long. When the system was finally tuned, we had shorted out the top 4 turns, thus reducing the number effectively to about 14.

With the L2 connected, a variable capacitor of about 100pF is connected in parallel with it as a temporary measure. The initial tuning is done with a GDO, coupled into L2. The variable capacitor is adjusted to bring the resonance right for the 7MHz band. The exact frequency will be up to individual choice, but it may be in the vicinity of 7.075MHz. The 3.5MHz frequency is adjusted with L2 itself, turns being added as required. Again, the exact frequency may be set to 3.6MHz, or thereabouts.

Having initially found the two wanted frequencies, it will be necessary to go back and forth, as before, until both frequencies are correct.

At this point, we are again ready to start on the more serious business of coupling the feedline into the system and adjusting it for minimum SWR. The coaxial line from the transmitter is connected with the outer conductor to the junction of the radials and the bottom of the vertical. The inner conductor is run via another variable capacitor of 150pF or so, to a point 12in above L2. The series capacitor should be set to approximately 88pF as shown in the diagram, this being the value which we finished up using.

The transmitter is now needed and should be set to the 3.5MHz band centre frequency and lightly loaded into the system at first. An SWR bridge should be connected into the line, close to the aerial feed point. If the bridge is not available, then a field strength meter may be used.

Set the SWR bridge for reflected power and check for centre frequency by introducing a piece of ferrite aerial rod into L2. If the meter drops, then L2 may need to be increased. Conversely, the opposite would be true. In cases where a field strength meter is used, adjustment would be made for maximum meter reading. Continuing, the series feed capacitor is now adjusted for minimum SWR, or maximum field strength.

The same procedure is adopted for the chosen frequency of the 7MHz band; but this time, any adjustment in resonant frequency should be made with the variable capacitor across L2. The series capacitor is checked and adjusted if necessary, for minimum SWR or maximum field strength. The process must be repeated on each band, until adjustments are complete. If the series capacitor setting is not the same for both frequencies, then a compromise will have to be made and individual circumstances will dictate what this might be. However, the setting should be fairly close for both bands.

Having completed the final adjustments, the two variable capacitors may be installed permanently, provided that they are protected from the weather. An alternative, and one which we adopted, is to replace the two capacitors, each with a piece of coax cable. To do this, carefully remove one capacitor at a time and accurately measure its capacitance. A piece of coax cable is then cut to length to give exactly the same value of capacitance. The cable is then connected into the place of the former capacitor. This method has the advantage that the cable is better able to withstand the rigours of the weather.

At this stage, the new vertical is ready for service. If the experience of the writer is any indication, readers will find that although the system occupies a minimum of space, it will give a good account of itself. An important point which should not be overlooked is the fact that the aerial as described only has two radials. This would be a bare minimum and there is little doubt that if space is available to add extra radials — the more the better — results would be improved accordingly.

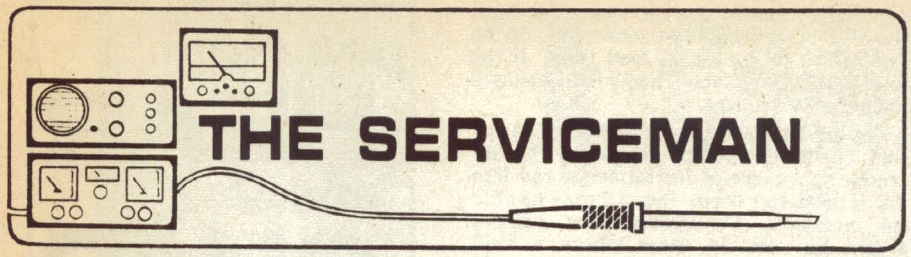
Just one final point. The thought has crossed the mind of the author that it may be possible to achieve some measure of directivity by switching in and out radials, as required. It has been established that one, two, or even three radials of the high band system can be disconnected, without upsetting the SWR. I have not checked the idea for directivity at the time of writing. If any reader tries it, I would be interested to hear of the findings.

REFERENCES

RUCKERT, H.F., "Tests with Multiband Components and the VK2AOU Triband Beam" in **Amateur Radio**, May, 1958.

RUCKERT, "The Triband Beam at VK2AOU", in **Amateur Radio**, June, 1958.

RUCKERT, "Single Loop Triband Cubical Quad Element", in **Amateur Radio**, April, 1968.



THE SERVICEMAN

Comments on Transistor TV Set

More than once in recent months I have commented on what I feel is a failure on the part of manufacturers to fully back their products, for either the customer or his serviceman.

Following my story and rather caustic comments in the May issue, I have received some letters commenting on this situation. Reproduced below are two of these which, as it happens, both come from Victoria.

Dear Sir,

In the May 72 edition of your journal I was very disturbed to read the article by "The Serviceman" relating to the faults in a transistorised TV set. What disturbed me was:

a. *that such a state of affairs in relation to TV existed,*
b. *that the manufacturer seemed so reluctant or incapable of disseminating the information required on the modifications.*

I am only a part time TV serviceman and therefore, compared to a full time man, my experience is very limited. However, as a serviceman in the armed services I am aware of the wide dissemination of information and corrective action taken to rectify defects in manufacture of service equipment.

In the story related by your contributor the name of the set is not stated. However, from my own knowledge, there is one make of set (. . . . .) which described the tuning of the EHT transformer to obtain the humped curve required. If the set in question is a . . . . . , in fairness to the company concerned, they have fully described the modifications in their house journal and also stated the precautions necessary, such as replacing the fuse with a resistor, to limit the drain while the transformer is being tuned. Also, the modifications have appeared in the TETIA publication "Teletronics".

However, I heartily agree that transistorised equipment appears to have been put on the market before extensive trials have brought out any design defects.

Yours Faithfully,
J.S.

Dear Sir,

Re the May 1972 issue and the line output transistors. I assume this to be a . . . . . receiver, judging by the "double hump" characteristic mentioned.

I have not experienced this problem recently, but I seem to recall a suggestion by Mr . . . . . (of the manufacturing company) to remove the line output fuse and replace it with a resistor (a value of 15 ohms rings a bell in my poor memory) while tuning, to protect the transistor. Naturally the fuse is replaced in the set when the tuning is completed.

Hoping this is of some help and thanking you for your most interesting stories.

Yours Faithfully,
J.H.

I am grateful to these two gentlemen, and the others who have taken the trouble to comment and supply information. At least the situation is a little clearer in the technical sense.

However, I'm afraid that my feelings about the manufacturer's responsibilities remain the same. For the fact remains that, while this particular manufacturer had evolved a technique to cope with the problem I encountered, I was unable to find out anything about it, in spite of repeated requests made directly to him.

In his letter, J. S. expresses the same kind of concern, and compares the situation with that in the armed services, where the distribution of such information is highly organised. He also quotes two publications in which the vital information was presented. Unfortunately, civilian manufacturers, unlike the armed services, do not have a "captive audience" to ensure complete coverage. In this regard they can only do their best via trade journals etc. As a result, it is inevitable that some servicemen will miss out.

Fair enough. But the real beef is that, when servicemen who appreciate this problem seek to overcome it, by going straight to the horse's mouth, they can be frustrated, as I was, by ignorance and indifference on the part of those concerned.

Nor does it temper my feelings concerning the string of "mods", as long as one's arm, which the serviceman is expected to do on the firm's behalf. And who pays for it? Can it be loaded on the customer, or must the serviceman carry it?

I still think it is time the manufacturers pulled their socks up.

And now to this month's main story.

Material for the stories presented in these columns comes from many sources. In addition to those which result from my own first-hand experiences, some come from other professional servicemen, others come from technically qualified people servicing their own equipment. The story which follows comes from a friend who is not a serviceman but has a technical background, and who likes to do his own servicing. This not only saves him money, but gives him the satisfaction of achievement when a particularly sticky fault comes to light.

Naturally, not having the equipment and facilities of the professional, he has to feel his way on occasions, but apart from the time factor, which often results in a piece of equipment being out of service for days or even weeks, the only other disadvantage is that occasionally items such as valves have to be bought on speculation.

On the other hand, as his time is his own, he can sometimes spend more time in salvaging damaged parts than the professional servicemen would be prepared to do. Which brings me to this story.

The piece of equipment in question was an early model television receiver which had been picked up cheaply as it obviously was not working properly. The previous owner had purchased a new set, and had been using the older one as a second set. In fact, he had spent some money on having it repaired a short while ago but, after only a few weeks of additional service, it had suddenly failed.

Apparently the failure had been accompanied by a strong smell of burning, and blue smoke had issued from the set's interior. This had somewhat unnerved the owner, and he had apparently decided that the set, which was over ten years old, had outlived its useful life. It had been reposing in a corner of the garage and when my friend learned of this, he had offered to buy it. A bargain was soon struck, and both appeared very happy with the deal. The set was a well-known make, and despite its age was quite handsome in appearance. It had obviously been well cared for, and the original polish was intact.

The idea was to fix the set, if possible, and use it as a second set so that family conflicts as to who was going to watch what program at any particular time could be avoided. Tensions from this cause always rose to a climax during periods of test cricket when, to the dismay of the rest of the family, my friend would monopolise the TV for days on end, depriving the rest of the family of their regular programs.

A situation by no means unique in family circles!

However, to return to the set. Duly installed in the workshop, it was connected to

power and switched on. Whatever had caused the burning smell and blue smoke had presumably completely destroyed itself, since there was now no evidence of any such symptom.

What was very much in evidence was the restricted horizontal scan, showing only as a vertical band of light about 1½ inches wide up the centre of the screen. An examination of this showed that there was no video present in the scanned area, neither was there any sound. The level of brightness was also very poor.

Right at the start this seemed to indicate a fault in the EHT or line output sections — but why no program? A glance at the circuit which my friend had acquired in the meantime showed why this was not only possible but probable. The set used gated AGC, and as many readers will know, this type of set normally acquires its gating pulses from the EHT section. If the EHT fails, the AGC valve is not gated into conduction, the AGC is disabled, and a lock-out condition occurs.

It seemed logical to disregard the loss of program and press on with locating a fault in the line output / EHT section.

Using established fault-finding procedure, the EHT lead was first disconnected from the tube and checked for the presence of EHT by the usual method of holding the tip of the lead a short distance away from chassis. The lack of any obvious spark established that the diagnosis was on the right track. There was very little EHT. The next step was to move back one stage, and try to draw a spark from the lead to the top cap of the EHT rectifier. A blank was again drawn.

One possibility was that the 6DQ6A line output valve was sick. Fortunately, a good 6DQ6A was to hand, to substitute. Initial investigation produced results, but they were rather unexpected. When the lead was pulled off, the top cap came with it. It did not come cleanly away, leaving the wire to the anode still neatly held by its nipple of glass. Instead, it remained fixed to its wire and the glass nipple broke away to the sound of splintering glass. Well, a valve with a hole in it can hardly be expected to function. But was the valve faulty anyway, before the glass broke?

The answer was soon provided. The new valve did nothing to cure the fault. The thin band of brightness up the centre of the screen remained stubbornly as it had been before.

Hard luck!

My friend next considered the possibility that the drive for the 6DQ6A had failed, due to a fault in the previous stage. The usual arrangement for these stages is that bias is developed across the grid resistor, and if drive fails, bias is reduced. Result — the valve overheats rapidly. If left unchecked in this condition, the anode may eventually glow cherry red.

Some support for this theory was provided by the condition of the top cap lead insulation which was dark and brittle, as though it had been heated. In any case, it was replaced to prevent further troubles.

The best my friend could do to check the drive was to connect a sensitive AC meter to the grid of the 6DQ6A. A healthy deflection suggested that there was plenty of drive.

The most obvious checks in locating an EHT or line output fault had now been

(Continued on page 125)

Microwaves for the radio amateur—4

This is the fourth in a short series of articles written in an attempt to stimulate activity by radio amateurs on the microwave bands. This month the author deals with wavemeters, ferrite devices, power generation and klystrons, and antennas.

by DES CLIFT, VK2AHC*

Frequency measurement can present problems for the amateur microwave enthusiast. Even the amateur with quite a respectable array of equipment and facilities for HF and VHF generally finds himself unable to measure microwave frequencies with sufficient accuracy to tell with certainty whether he is inside or outside the allocated band.

Microwave wavemeters and radar test units known as "echo boxes", both calibrated in terms of frequency, have appeared on the surplus market from time to time, but never in large quantities.

Those fortunate enough to possess a slotted line can obviously measure frequency directly, by a measurement of the waveguide wavelength inside the waveguide. This is then converted to free space wavelength and hence to frequency. The technique is covered in almost every text book of microwaves.

For those not in the above categories the following course of action is recommended and will confirm the conviction that it is possible to produce homemade apparatus of accuracy comparable with that of expensive commercially made items.

A wavemeter can be produced, based on a cross coupler similar to that shown last month in Fig 10 but having one coupling hole of about 20-25 dB. This feeds a length of waveguide in which is a movable plunger forming one end of a cavity. The unused end of the waveguide is blanked off. Resonances occur at the frequency of the incoming microwaves, and if the difference in mechanical position of the plunger is measured for adjacent indications, this is then half the waveguide wavelength, which again can be converted to frequency.

It is reasonably easy to measure frequency to ±10MHz in 10,000MHz (ie, 0.1%) with this device. A practical unit is fully described in the RSGB Bulletin for May 1958, together with a spot frequency cavity for 9375MHz (the design frequency of a large quantity of American surplus airborne radars) and 10,000MHz, the lower band edge of the amateur band. The arrangement for the measurement is as shown in Fig 13.

A large number of educational establishments possess wavemeters which cover X band. If an absolute calibration of the above, or any uncalibrated surplus wavemeter is required, no doubt this could be organised. The writer will also be glad to assist any amateur who is in difficulty with calibration of wavemeters and other components.

*12 Romford Rd, Frenchs Forest, 2086

Ferrite Devices

All the waveguide pieces discussed so far are bi-directional. An exception to this rule are waveguides containing ferrite slabs or rods. The most popular components are the isolator or one way attenuator, and the circulator (see Fig 2c of first article for an example of use), in which the direction of microwave energy flow to and from a number of fixed ports is always in a known, controlled direction.

A ferrite material is the basis of these devices and is used with either an electromagnet or a permanent magnet. The material is a very low loss ceramic mixture of the oxides of iron and other metals, such as nickel, cobalt, magnesium, manganese and aluminium, which are fired at temperatures in the region of 1300-1400°C.

This material can be likened to lots of little magnets randomly orientated. With the application of a given magnetic field, the axes of all the particles align themselves with the direction of the applied field. This takes place in a few nano seconds, and the operation is known as precession. If, however, an RF field is also applied a condition can result where quite large non-reciprocal losses are present, so that energy can flow much more readily in one direction than another.

Isolators, by far the most widely used ferrite devices at present, operate where the RF field resonance is the same as the natural precession frequency. They are, therefore, referred to as resonance isolators. The ferrite material is either placed on opposite faces, or right across the waveguide at a distance about quarter way across the broad dimension. At this point in the guide the RF magnetic field is circularly polarised. When resolved into two components, one will be rotating in the same sense as the natural precession, and suffer loss. The other will be unaffected.

If, however, the magnetic field is not at that value at which natural precession takes place, components are produced using an effect called Faraday rotation. This is the basis of ferrite phase shifters, circulators, modulators and switches. These devices can take the form of a rod of ferrite along the axis of circular waveguide. Applied microwave energy is made to rotate through 45° by applying a suitable magnetic field. It is then either taken out, dissipated, or reflected, depending upon what the final form of the component is to be.

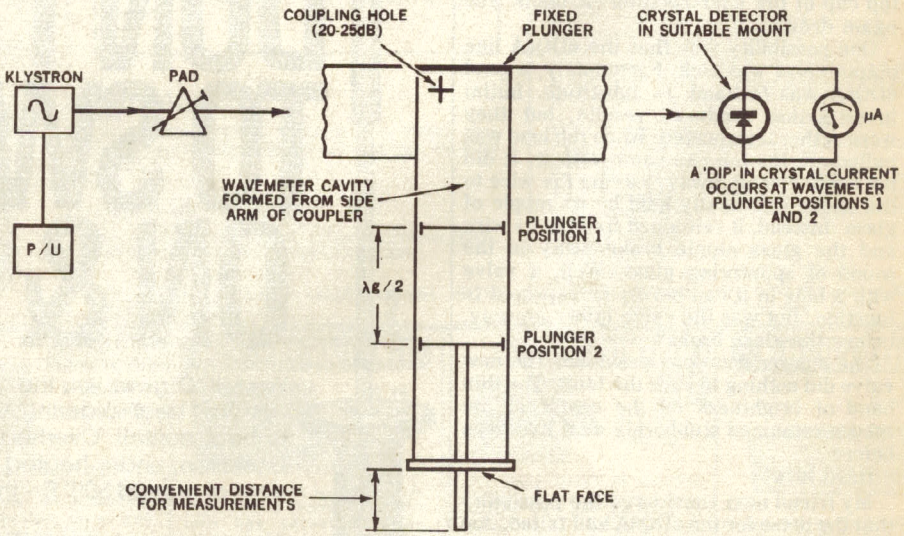


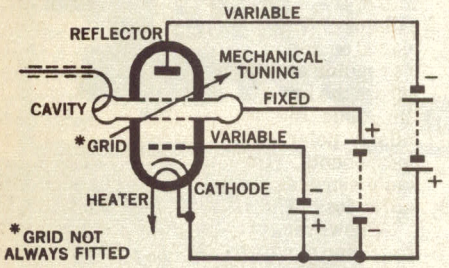
Fig. 13 USE OF HOMEMADE WAVEMETER

RF Power Generation

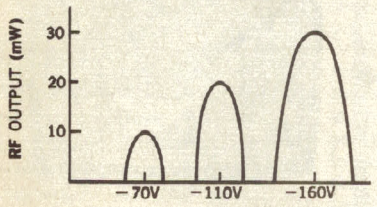
For the 3300, 5650, and 10,000MHz bands the reflex klystron is probably still the easiest and cheapest method of obtaining

enough microwave power for amateur communication over 20-100 miles range. Suitable klystrons are the 2K25 / 723 A / B series for 10,000MHz and the 726A for 3300-MHz. These types have been available in reasonable quantities since the war, since they were used extensively in airborne radar equipment. They have internal cavities, and their output is via a short coaxial line.

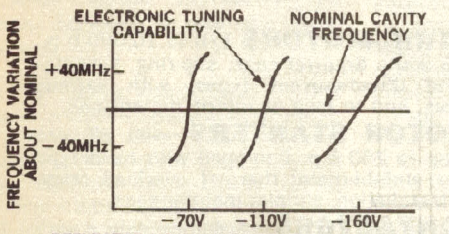
More modern types such as the CV2346 suitable for both 5650 and 10,000MHz and the CV2116, sutiable for 2300 and 3300MHz require an external cavity and are, therefore, more versatile. Other modern CV types, usually of the English Electric K series have appeared in small numbers on the surplus market from time to time. Some of these operate in the 10,000MHz amateur band, others require modification, and others designed to operate between 8000 and 9000MHz do not appear to work at 10,000-MHz. An exception is CV2282 (K308). All these latter types have waveguide outputs and are thus easy to couple to the rest of the system.



CIRCUIT ARRANGEMENT



REFLECTOR CHARACTERISTICS



REFLECTOR VOLTS WITH RESPECT TO CATHODE (ALSO DEPENDS ON ACTUAL CAVITY FREQUENCY)

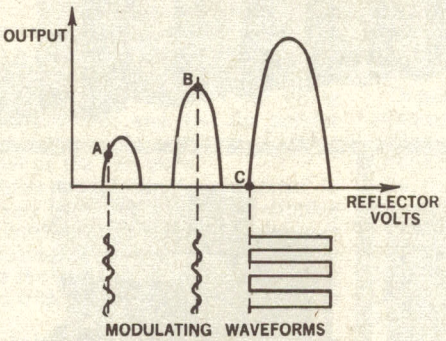
Fig. 14 TYPICAL REFLEX KLYSTRON AND ITS REFLECTOR CHARACTERISTICS

The principle of operation of all these reflex klystrons depends upon the "transit time" effect, as follows. In a typical klystron (Fig 14) electrons are emitted by the cathode, the electron stream sometimes being controlled by a negative potential on an additional grid. The electrons are accelerated through the cavity grids and repelled by the negative potential of the reflector. If the valve is assumed to be already oscillating, an RF voltage will be present across the cavity, which is mechanically tunable.

The electrons travel between the two grids spaced in the centres of opposite sides of the cavity in a time which is short compared with the period of oscillation; their velocity is altered by the RF voltage on one of these grids. From the cavity emerge "bunches" of electrons, which are repelled by the reflector and arrive back at the cavity after a short period of time. The negative voltage on the reflector determines how far the "bunches" will travel into the space between the cavity and the reflector. At a certain reflector voltage, the "bunches" will arrive back at the cavity at the correct instant to reinforce and sustain oscillation.

The "bunches" of electrons can also arrive back at the cavity after longer intervals of time, producing less favourable conditions. Thus, as the reflector voltage is varied, the valve will oscillate in various "modes", which are usually referred to as, for example, the "160 V mode" or the "110 V mode". These voltages are the approximate reflector voltages which permit oscillation.

It may be seen that only for one value of reflector voltage will the transit time be correct for oscillation at the resonant frequency of the cavity in each of the



MODULATING WAVEFORMS

A : AM OPERATING POINT
B : FM PHONE OR TONE OPERATING POINT
C : MCW OPERATING POINT

Fig. 15 METHODS OF MODULATING A KLYSTRON

modes, although the valve does not stop oscillating with small departures from these conditions. Changes in reflector voltages, however, cause small frequency changes. Electronic tuning is therefore possible.

The methods of modulating a klystron are illustrated in Fig 15. For clarity, a different method of applying modulation is given for each of the three reflector modes. In practice of course only one of these types of modulation is used on one mode at any one time.

FM phone and tone is by far the most satisfactory method for amateurs. It is secured very easily by applying a few volts of audio telephony, or keyed tone to the peak of the reflector mode. Since the slope of the reflector / frequency characteristic varies with the operating mode chosen, a choice of deviation is available for experimentation.

AM phone is obtained (together with some FM) by operating the reflector operating point on the side of the reflector mode. By using a larger amount of audio than used for FM, reasonable quality AM is produced. This method is handy for initial experiments where an FM receiver is not available, as is the case of the use of a standard radar IF strip, but suffers from the disadvantage that

(a) the klystron is only giving a fraction of its potential output.

(b) the klystron, as used without AFC

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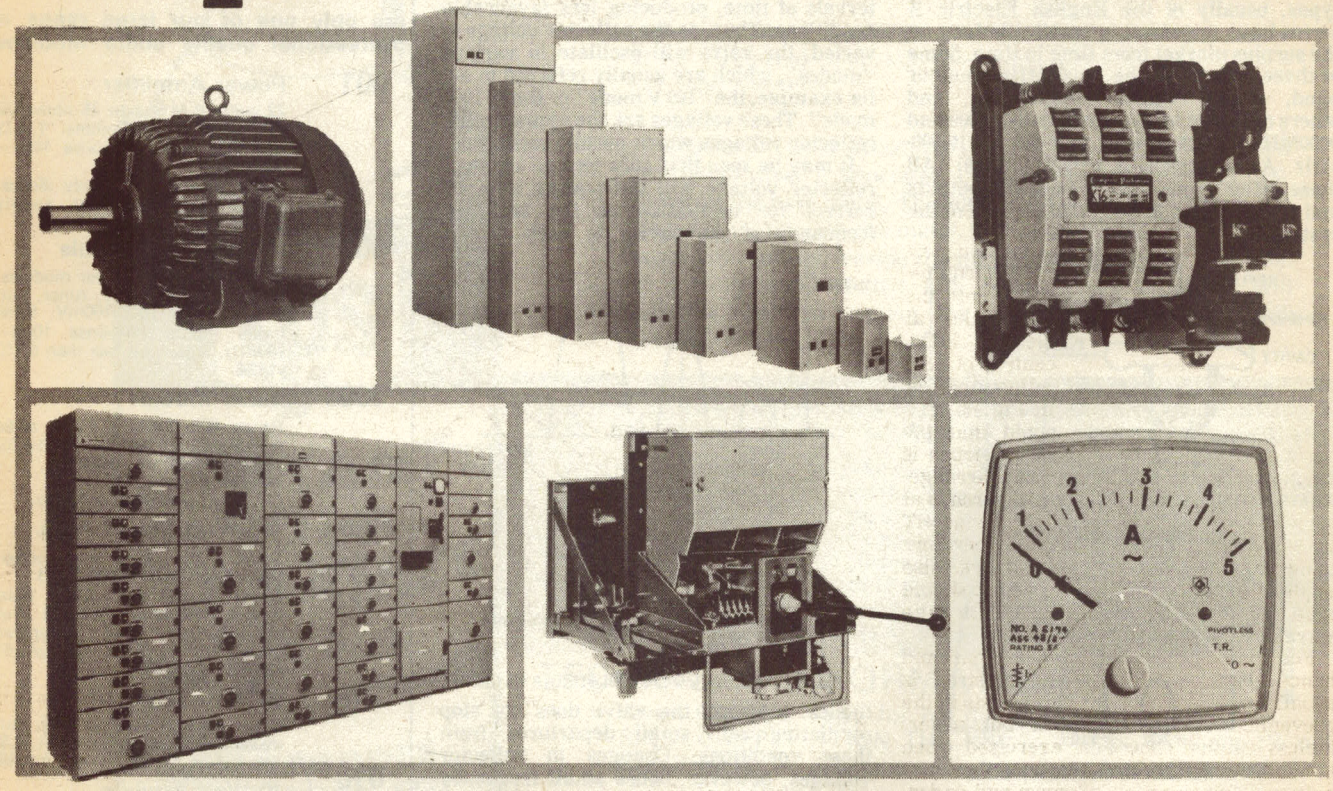

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(Automatic Frequency Control), as is usually the case with amateurs, will tend to drift somewhat and therefore require frequent readjustments to be made at both ends of the microwave link.

Modulated CW or MCW can be obtained by the application of a square wave of the order of 50 volts peak to peak, so as to sweep through one mode, but not run into the adjacent mode.

Particular care has to be taken to reduce the hum on the reflector to a very low value (under 10mV seems acceptable) before the application of the audio. This is easily done by a three or four section RC filter. A typical practical arrangement, showing this, and the use of a zener diode DC heater arrangement which also reduces unwanted FM, will be described in the next article.

Klystron Mounts.

Klystron mounts are required for X band and S band klystrons such as 2K25 / 723 A / B and 726A, which have a type of coaxial output.

Although most of the text books suggest (for 9375MHz) an offset arrangement for the injection of the coaxial probe into the waveguide, the writer has found that at 10,000MHz, the best arrangement is to place the probe in the centre of the waveguide and make an adjustment of vertical injection as shown in Fig 16.

WARNING: It should be noted that the outer shell and tuner of these kylstrons is connected to the cavity. In any arrangement where the cathode of the klystron is at earth potential, the cavity will be at HT potential (ie 250V to 300V) and therefore dangerous to handle. This remark also applies to the coaxial probe, which should also be suitably isolated from the waveguide.

For reasons of maintaining thermal and hence electrical stability the klystron is usually enclosed in a box. This assists in the prevention of electric shock but nevertheless caution should be exercised when handling operating klystrons until the exact nature of the circuitry is known and understood.

Antennas

This is a subject which the average experimenter tends to treat as a problem area but which in fact need not be at all.

Surplus parabolic antenna and feeds such as the AN / APS4 (suitable for use at 10,000-MHz) have recently been available, but probably the best approach is to make up reasonably sized horn antennas from thin brass or even tin plate. These give excellent results, both from the aspect of gain and due to the fact that they are virtually non frequency sensitive over quite large frequency ranges. The writer has produced S, C and X band versions and thoroughly recommends their use for all but the longer range contacts.

The fact that all these designs are based on the use of standard sizes of waveguide tube can be used to advantage since the user can mount the klystron and the other components on the one assembly. At the lower frequencies a simple transition to coaxial cable as illustrated in Fig 8 last month can be used.

Fig 17 (a) gives construction details of four applicable designs while Fig 17(b) shows examples of some of the finished items.

Fig. 17(a). (Right) Some examples of home-made horn antennas.

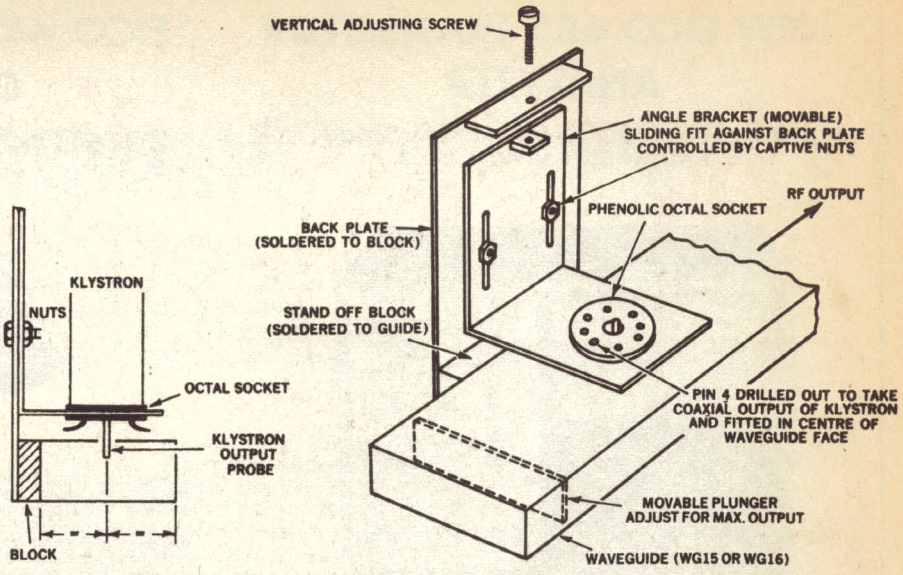
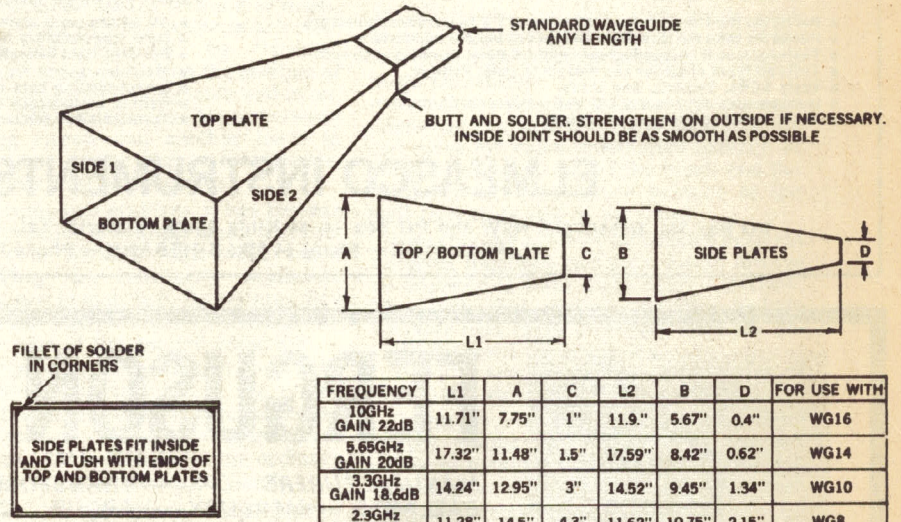


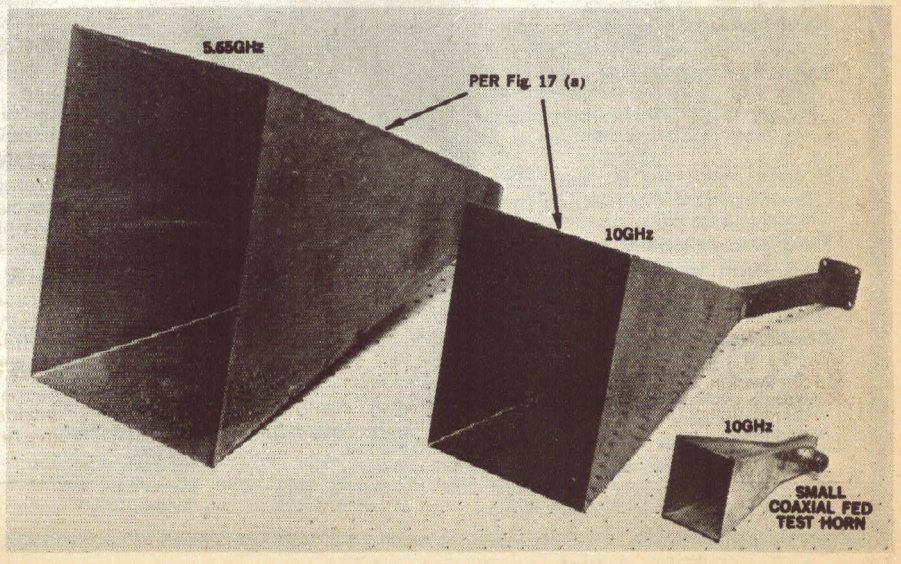
Fig. 16 KLYSTRON MOUNT FOR 2K25 / 723A / B ETC. FOR 10GHz



FREQUENCY	L1	A	C	L2	B	D	FOR USE WITH
10GHz GAIN 22dB	11.71"	7.75"	1"	11.9."	5.67"	0.4"	WG16
5.65GHz GAIN 20dB	17.32"	11.48"	1.5"	17.59"	8.42"	0.62"	WG14
3.3GHz GAIN 18.6dB	14.24"	12.95"	3"	14.52"	9.45"	1.34"	WG10
2.3GHz GAIN 16.5dB	11.28"	14.5"	4.3"	11.62"	10.75"	2.15"	WG8

DIMENSIONS GIVEN ASSUME THE USE OF MATERIAL OF SIMILAR THICKNESS TO WAVEGUIDE. THIS IS NOT REALLY NECESSARY PROVIDING CARE IS TAKEN WITH MATCHING SMALL END TO WAVEGUIDE

Fig. 17 (a) HORN ANTENNAS SUITABLE FOR AMATEUR MICROWAVE BANDS



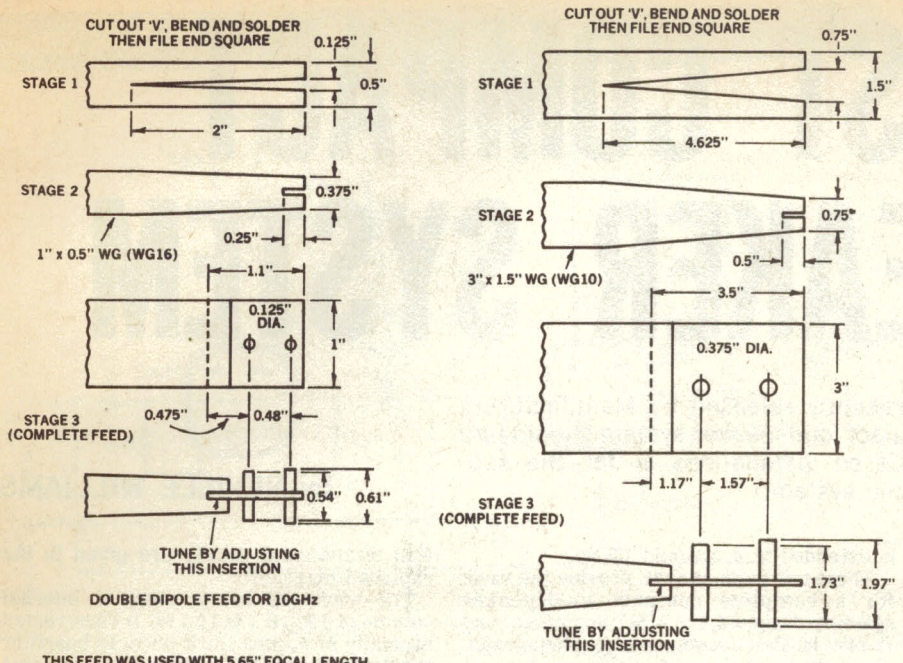


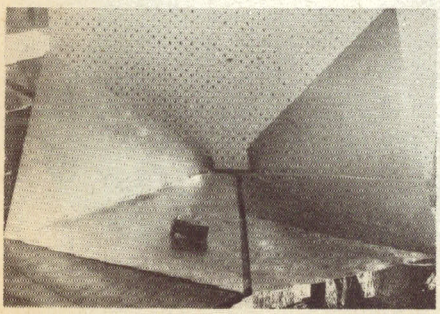
Fig. 18 DOUBLE DIPOLE FEEDS FOR USE WITH PARABOLIC ANTENNAS.

The horns can be made from four plates with dimensions as the table in Fig 17(a). These are not particularly critical except at the small end, where the inside dimensions should be carefully adjusted to mate with the waveguide. A wooden bung will assist in the location of this during assembly and also support the assembly while an outside strengthening piece is being added and soldered in place. A small blow torch is a necessity.

An alternative method of construction is to make the horn in two pieces. This makes the soldering and "holding in place" task a lot easier. In this case two plates, with "X" joined together would be cut, and bent at the point "X", a small (1/32" approx) reduction in dimensions A and B being made to compensate for the bend. Before trying this method, which is recommended, make up a trial horn with a piece of stiff paper. The extra effort involved may well be worthwhile!

For those in possession of suitable parabolic antennas, but with no suitable feeds to use with them, Fig 18 details two waveguide feeds suitable for use at 3300MHz and 10,000MHz. These require a little care in manufacture but are certainly not outside the scope of the average amateur, and they can be tuned for minimum reflection by a simple adjustment of the element supporting plate. A simple reflectometer, based on a directional coupler such as is shown in Fig 9 is all that is required for this tuning.

(To be continued)



A half-made 3300MHz horn with a tiny 10,000MHz horn for comparison.

LOW-COST COMPACT LOUDSPEAKER SYSTEM

Designed around a new driver unit recently released by Manufacturers Special Products Pty Ltd, this new compact loudspeaker system should find ready application in budget-priced stereo installations or for the supplementary channels in a quadraphonic system.

by NEVILLE WILLIAMS

For the most part, the success of a compact loudspeaker system depends on the availability of a suitable compact driver unit for the low and middle frequencies. The nominal diameter may be as great as 8 inches or as small as 3 inches but with most falling in the range 6-6½ inches.

With larger loudspeakers (say 10in diameter and upwards) air loading on the cone inside a small enclosure is likely to produce a prominent system resonance well above 100Hz. The audible result of this is what might be termed a "tubby" or "one-note" bass.

However, to be acceptable as a driver for a compact system, a loudspeaker needs to be more than just appropriately small. It must have a low intrinsic resonance so that, when mounted in a compact enclosure, the overall system resonance will occur well below, rather than well above 100Hz.

The driver must also have adequate power handling capacity at low frequencies and this calls for special attention to the cone structure and suspension, to the voice coil dimensions and to the design of the magnetic circuit. Other, more subtle aspects also have to be considered.

The new MSP 6½-inch driver pictured here is by no means the first such loudspeaker to be released by an Australian manufacturer for this class of service but it is almost certainly the most recent.

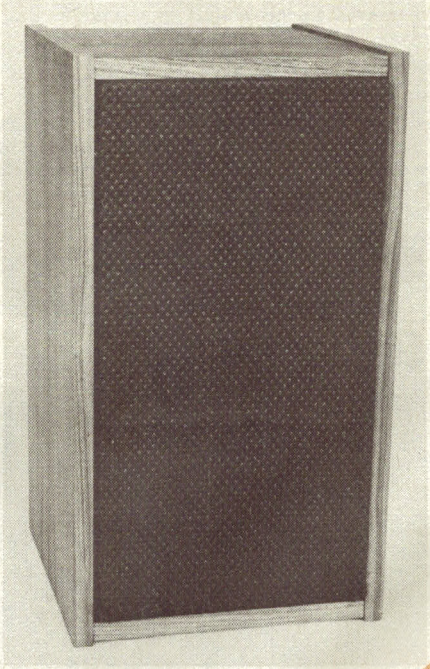
Unlike its counterparts, it uses a non-metallic housing moulded from high-impact glass-filled nylon, a substance which is claimed to give a high order of stability and rigidity without being brittle or subject to fracture. It can be mounted either behind or in front of the baffle opening, depending on requirements.

The suspension is designed to give high compliance, a low Q-factor (Q = 0.33), and a low natural resonance: 45Hz ± 7Hz. The voice coil is specially bonded to an aluminium former with a view to ensuring good power handling ability. Power rating is a nominal 16 watts RMS.

The new MSP driver is available with alternative values of voice coil impedance. Type LF-6WAC / 16 / 8 has a nominal voice coil impedance at 400Hz of 8 ohms. Type LF-6WAC / 16 / 15 has an impedance of 15 ohms.

Frequency response of the basic driver is quoted as 35-3000Hz. However, when paired with an MSP tweeter type 4MBC (8 or 15 ohms as appropriate) the effective response is extended to a claimed 18kHz.

These two units, in fact, provide the basis for a complete compact loudspeaker system, designed by MSP engineers and shown in the accompanying photograph.



The enclosure has been specially designed to enable constructors with limited experience and few tools to achieve a satisfactory result. Tricky mitring of corners is avoided by the raised sides.

Full dimensional details are given in the exploded diagram.

The enclosure has a nominal internal volume of 0.5cu ft (.015 cu.M) is constructed basically of ½-inch thick particle board or other suitable stock, and has a tubular port 6¾ inches long.

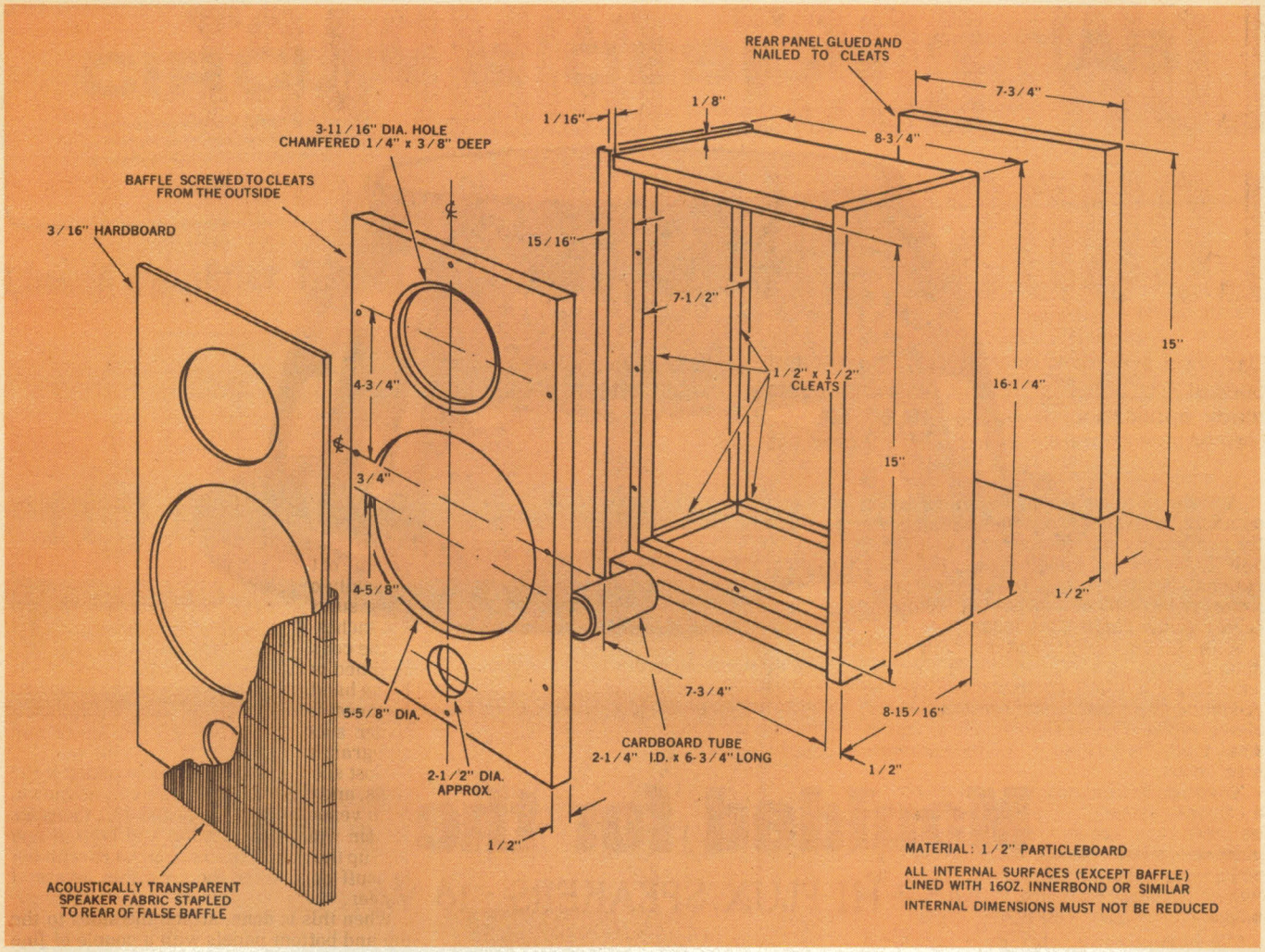
The construction depicted in the diagram is aimed primarily to meet the needs of the home handyman, who may not have access to precision woodworking equipment. Under such conditions, mitred joints and end-grain can pose quite a problem.

Most such problems will be avoided if the sides, and top and bottom are cut, as shown, from veneered particle board. Cut the sides 1 / 16in wider than the top and bottom and true up the edges. In so doing, be careful not to scuff or splinter the very thin layers of veneer.

When this is done, attach the sides to the top and bottom panels with a couple of fine panel pins, setting the panels down by 1 / 8in and back by 1 / 16in, as shown in the diagram. Do not drive the pins fully home but treat them rather as assembly guides.

This done, mark the insides of the box so that you will know which end butts to which. Then pull the pieces apart and coat the ends of the top and bottom panels with PVA or other suitable woodworking glue. Using the

RIGHT: The MSP LF-6WA has a moulded high-impact glass-filled nylon housing for a high order of rigidity and stability without being brittle or subject to fracture.



This exploded diagram of the loudspeaker enclosure will simplify construction.

pins as a guide, push the four panels together again.

Lay the structure on one side on a clean, level surface, prop something against the two ends so that they will be held exactly vertical, then place a weight on the uppermost side, so that the glued joints will be pressed together. Leave it overnight, or for as long as necessary, for the glue to set firm.

This method of construction hides the end grain of the top and bottom panels and leaves that of the side panels slightly "proud". When other work on the cabinet is complete, it will be a relatively simple matter to apply to these edges a strip of matching veneer and to dress the corners with a modelling plane and very fine abrasive paper. It is possible, by these means for a non-professional handyman to obtain a highly professional result.

Before adding these finishing touches, however, it is wise to proceed with the internal structure. Pin and glue cleats of ½in square timber to strengthen the corners and to support the baffle and rear panels. Before asking your supplier for precisely cut stock, see what he has in the way of oddments "that might do for cleats".

We suggest wood for the cleats rather than particle board, because it provides a rather better grip for the screws, particularly if you have reason to drive the screws home more than once. Make sure that the cleats butt firmly against each other and that the outer surfaces are properly aligned.

The cleats should be installed so that the rear panel will finish up exactly flush with the sides and top. The face of the baffle, on the other hand, will need to be set back by 7/16in from the front edge of the side panels. Ultimately, both will be held in place by eight screws, as indicated although, in fact, one or the other can be fixed permanently in place, if desired.

Cut and dress the baffle panel and the rear panel so that they will fit snugly into the outer shell, establishing a virtual air seal against the inside walls and cleats. Care is essential in this respect, since air "pumped" through unintentional cracks by low frequency energy can produce whistling or hissing noises.

Neat apertures need to be cut in the baffle for the two loudspeakers and for the 2-¼in ID port tube. This latter can be of stout cardboard and is the kind of item which is becoming fairly commonplace from retailers handling home construction kits for hifi loudspeakers. On the other hand, suitable tubing often turns up inside reels of paper for copying machines, &c. The hole in the baffle should be a snug fit for the tube, which will need to be glued in position.

Note that the outer edge of the hole for the tweeter should be chamfered, so that the tweeter does not have to radiate high frequencies through a tunnel formed by the sides of the hole. Chamfering is not important for the main driver and would be undesirable in any case, because it might compromise the grip of the loudspeaker mounting screws.

Both louspeakers, by the way, should be mounted behind the baffle.

The face of the baffle, the inside of the vent tube and the edges of the loudspeaker holes should be painted with flat black to prevent anything showing through the fret cloth.

To dress the front of the enclosure, a false baffle is suggested, cut from 3/16in hardboard or plywood. The cut-outs in front of the loudspeakers can be marginally larger than in the main baffle, to ensure free egress of the sound. The surface should also be painted in flat black, then covered with a suitably acoustically transparent cloth matching the room decor.

Dress the false baffle to a size such that it will slip snugly into place with the cloth in position. It will take a little care to get the cloth firmly stapled in position, while maintaining straight vertical and horizontal lines in the weave. Naturally, the more prominent the lines in the cloth of your choice, the tougher will be the job of making it look right!

The popular way to hold a false baffle in a cabinet, these days, is with small pieces of "Velcro" tape. Glue or staple a piece in

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PAT. APP. FOR

each corner of the false baffle and pieces about half-way down, to either side of the main loudspeaker cut-out. Affix corresponding pieces on the face of the main baffle. When the false front is finally pushed into position, it will take quite a firm pull to coax it off again!

While the drawing and the article have assumed a particular method of construction, individual handymen and certainly professional woodworkers may choose another approach. For example, covering end grain will not be a problem if you elect to build the cabinet from ordinary particle board and to cover it with iron-on veneer or a synthetic imitation wood-grain finish. The end result will not be affected, as far as sound is concerned, provided you adhere to dimensions and to the requirements for rigidity and sealing.

All inside faces of the box, other than the rear of the baffle should be lined with 16oz Innerbond or similar acoustic absorbent material. It can be held in place with staples or upholstery pins.

Arrangements must be made to bring the connecting leads into the box without creating holes through which air can leak. The simplest method is to drill a small hole through the rear panel for a pair of leads, sealing the space around the leads with a non-hardening putty. Use colour-coded twin loudspeaker flex, so that you will be able to keep track of the "positive" or active side of the system.

If the idea of a captive lead does not appeal, any suitable connector or polarised socket can be used, provided it does not compromise sealing of the box.

Inside the box, the coded lead you have selected as active should go to the terminal on the main driver marked with a positive sign, continuing on to the positive side of the tweeter, as shown.

The negative lug on the tweeter should connect to the negative lug on the driver through a series capacitor. In fact, the MSP tweeter carries an extra vacant lug which can provide a mounting point for the free end of the capacitor.

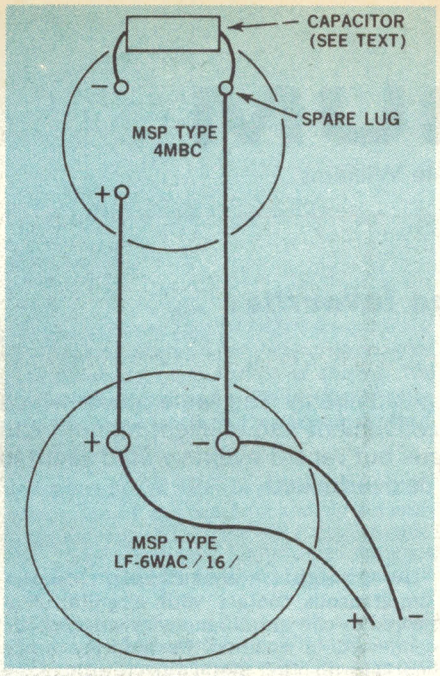
For an 8-ohm system, the series capacitor should be a 3.3uF paper or polyester type — not an electrolytic. For a 15-ohm system, the series capacitor should be 2 or 2.2uF.

How does the system behave in practice?

In terms of impedance, the 8-ohm version shows a minimum value of 8.5 ohms at 300Hz, so that there is nothing to endanger the output stage of a transistorised power amplifier. Above 300Hz, the impedance remains within the range 9 to 11 ohms. Below 300Hz, the characteristic follows the classic pattern for a ported system, with an impedance peak at 90Hz, falling back to 9.5 ohms at 50Hz and with another impedance peak at 25Hz.

The acoustic efficiency is about average for a compact enclosure. This means that it can be used with lower powered amplifiers in situations where only modest acoustic power is required. However, its substantial power rating would allow it to be driven much harder by larger amplifiers, if required; hence its suitability for supplementary use in quadraphonic systems.

In terms of overall balance, there is some prominence in the middle register — a characteristic which tends to give a "forward" quality to solo instruments or solo voice. It is a somewhat less agreeable characteristic for complex sound as, for example, from a large choral group.



This is how the system should be wired internally. Note that by using the spare lug on the back of the tweeter for anchoring the capacitor, no tag strip is required.

But this is the kind of effect exhibited by many loudspeakers, irrespective of brand and cost.

The important thing is that the new MSP system is well worth considering where size and cost both need to be kept to a minimum.

FOOTNOTE: MSP are able to supply a wide-range version of the driver, fitted with a tweeter cone. This has a claimed response to 18kHz and is available in either 8 or 15-ohm versions (types 6WACX / 8 and 6WACX / 15 respectively). The structure has been modified slightly to give a marginal increase in sensitivity but with a reduction in power output rating to 10 watts RMS.

The bass characteristics are virtually unchanged, and the wide-range version could be used in the type of enclosure illustrated. Since a tweeter would not be required, the tweeter cut-out would be omitted. The single main loudspeaker could logically be moved closer to the top of the baffle, to provide for the possibility of the enclosure being placed on the floor.

We have not had the opportunity to test this particular version but it would appear to have interesting possibilities for systems less expensive again than the two-speaker unit described.

FORUM

Conducted by Neville Williams

The mains voltage knows no favourites . . .

Electricity, like fire, is a good friend but a bad enemy. The same power which lights and warms and moves in a most convenient and efficient manner can also kill. Perhaps I am stating the obvious but recent events would seem to indicate that the obvious can too easily be overlooked.

A recent news item in the press featured a statement by the Chairman of the Electricity Authority of NSW, Mr F. H. Campbell.

Mr Campbell warned that many portable amplifiers used by pop music groups do not comply with Australian electrical safety standards being, in fact, a potential hazard to anyone using them.

Mr Campbell is certainly not exaggerating the situation. From time to time we have heard reports of performers receiving a shock from amplifying equipment, sometimes with tragic results. To be specific, we reproduce in precis form in the accompanying panel a report in the Sydney "Sun" concerning a coroner's inquest held recently in Wollongong, NSW.

How do such things happen and why are "pop" amplifier systems in particular open to question?

The answer lies in the nature of the equipment and the way it is used.

Pop group amplifiers are almost invariably of the portable variety, relying on trailing leads for their connection to the AC supply and to earth via the power point. This, of course, is true of a great many mains-operated appliances, from toasters to television sets but there are two notable points of difference.

Most domestic appliances are under close scrutiny and control by the electricity supply authorities. Whether manufactured locally or imported, they cannot legally be sold in Australia unless they conform to rigid safety standards.

There is no such control over portable amplifying equipment. A supplier may seek type approval as a matter of prudence but he is under no legal obligation to do so.

A second point is that amplifiers are of no value in themselves; they have to be connected to input and output devices. So, when a pop group arrives with their amplifiers, the next operation is to bring in the guitars, the microphones and the loudspeakers and plug them in to the relevant sockets.

When a performer subsequently picks up a guitar and strokes the strings with his hands, he is making contact with metalwork which is electrically bonded back to the amplifier.

When he nuzzles up to a microphone or takes a firm grip of the stand, he is doing likewise.

He might conceivably make simultaneous contact with a guitar connected to one amplifier and a microphone connected to another. Or he may make contact with other metal objects around the stage.

The interconnection of the guitar, microphone and amplifier metalwork is not just a convention or a whim of the manufacturer. It is done deliberately to combat hum injection, penetration by radio and television signals, and interference from lighting dimmers, etc.

In the normal way it does not produce any kind of a hazard; quite the reverse, in fact. The third wire in the power cord links the metal work or "earthy" circuitry in the amplifier to the earthed pin in the power point. Therefore, the metalwork of all the amplifiers, all the guitars and all the microphones is at earth potential. The same should be true of exposed metalwork on stage lighting fixtures, etc. It should be impossible to sustain a shock under such conditions.

Unfortunately, these conditions are not always realised, particularly in equipment which is designed overseas and imported, either by individuals, or by business concerns which lack a technical background.

Many overseas manufacturers are accustomed to supplying a market which involves 110V mains and a two-wire power cord — with no provision to earth the frame of the device.

The most obvious difference about the Australian and European markets is that they require 240V operation. The overseas manufacturer may simply adapt the internal works of the appliance to 240V operation, taking no special precautions with the high voltage, and still supplying the original 2-wire cord and plug.

In Australia, the purchaser simply cuts off the original 2-pin plug, substitutes a 3-pin plug and puts the appliance into service with no earthing provision. If it happens to be an amplifier, the microphones and guitars connected to it consequently lack an earth return and are free to float at some random (and hopefully small) potential above earth.

If the power transformer has adequate insulation around the primary winding and everything else is in order, the worst that is likely to happen is that a performer may notice a "tingle" when he touches some of the metalwork. This would be the result of stray capacitive coupling between the mains and the metalwork.

However, if an ohmic path were to be set up within the amplifier between the mains and the chassis, the metalwork of the amplifier, guitars and microphones could become "live" at the full mains potential. The lethal path might be provided by a stray strand of wire in a fraying lead, by breakdown of a mains bypass capacitor or breakdown of the insulation within the power transformer itself.

This is the very situation that the earth wire is there to protect against. With an effective earth, any such path to chassis would simply result in blown fuses and a service call to discover what had gone wrong.

Without the earth wire, the live metalwork would be a potential death trap for any performer who happened to touch it while also in contact with an earth return path.

Some of the attempts by oriental manufacturers to accommodate to Australian wiring practice have been more dangerous than their omissions.

Two such situations were the subject of reference in earlier issues.

One involved fitting regular 3-core flex to equipment but with the black wire used for the earth return. This is an open invitation for some unwary person, when changing a plug at a later date, to assume green as the earth, and to connect black (and therefore chassis) to one side of the mains.

Worse than this was a batch of test instruments which landed in the country with the black wire connected to chassis and the green wire connected to the earth pin of the power plug. A staff member found out about the error in a very painful manner, when he "copped the lot" on the test bench.

Nor is this just a piece of history. The illustration shows an example of oriental power pluggery which we came across only

LETHAL GUITARS

A Coroner has claimed that there are hundreds of lethal electric guitar amplifiers in use by NSW musicians.

But there is no official control over importing or selling the killer instruments.

Technicians at the Sydney County Council equipment testing division said today that amplifiers were not on a list of electrical goods requiring a compulsory check-out. It was not essential for the importer or retailer to submit them for examination.

"A voluntary test scheme does operate and if an amplifier submitted for this was proved to be faulty, the importer or retailer would be instructed not to market them until necessary modifications were made," one technician explained.

Wollongong coroner, Mr B. J. Wilson, said that some 500 guitar amplifiers had been released on to the market despite an SCC warning that they were "hazardous."

Mr Wilson was inquiring into the death of a 16-year-old Wollongong youth who died from an electrical shock while playing a guitar attached to a faulty amplifier. (Sydney "Sun", June 14, 1972)

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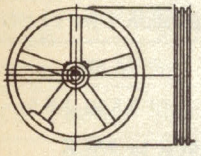
PLASTIC DIAL DRUMS



ALL ¼" cent.

BRASS INSERT

PART	MM	PRICE
Z1	108.3	70c
Z2	89.2	46c
Z3	79.5	40c
Z4	70	36c
Z5	63.7	34c
Z6	57.3	30c
Z7	54.1	29c
Z8	44.5	28c
Z9	40	27c
Z10	30	26c

PACK OF 4 ASSORTED DIAL SPRINGS PLUS 8 ASSORTED PULLEYS
55c

Dial drive cord
5 yards 40c
25 yard spool $1.00

ANTENNA SWITCH

SX 120 (2P) 33c
SX 110 (1P) 24c

PMG KEY SWITCHES

Su-020-4P $1.10
Su-040-4P-Reaction $1.10
Su-010-2P 98c
Su-015-2P-Reaction 98c

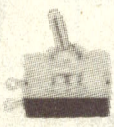
TOGGLE SWITCHES

2P (SPST) 48c
SA-110

4P (DPST) 56c
SA-210

6P (DPDT) 60c
SA-220

CENTER OFF
6P (DPDT) $1.00
SA-201

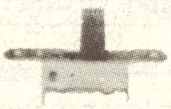


2P (SPST) 48c
SA-112

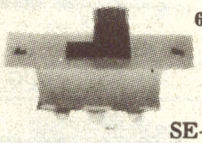
SPEAKER SELECTOR SWITCH: 36c

SY-010

SLIDE SWITCHES



2P (SPST) 18c
SE-110

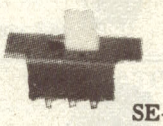


6P (DPDT) 24c
SE-210

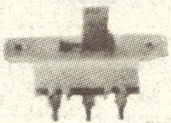
As above but
SE-122: 3P (SPDT) 22c

6P (DPDT) 20c
SE-211

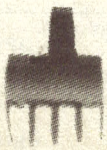
As above
SE-120: 3P (SPDT) 21c



6P (DPDT) 33c
SE-212

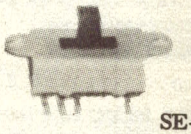


6P (DPDT) 45c
SE220



6P (DPDT) 24c
SE-230

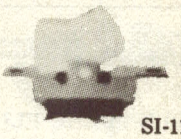
SLIDE SWITCH



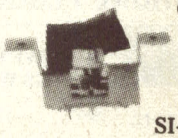
(3P3T) 53c
SE-330

SEE-SAW SWITCHES

2P (SPST) 34c
SI-110

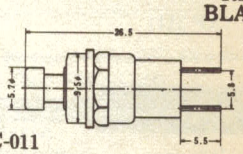


2P (SPST) 52c
SI-111



6P (DPDT) 53c
SI-220

MINIATURE PUSH BUTTON SWITCH: RED BLACK



SC-011

INSTANTANEOUS ON 32c

SLIDE SWITCH

SE-530
(5P3T) 65c

JAYCAR COMPONENTS

PO BOX 39
HAYMARKET
NSW 2000

HIGH QUALITY METAL AUDIO CONNECTORS & ADAPTORS

KW-010 — MINIATURE PLUG to RCA PIN JACK: (P 3.5 to J RCA) 41c

KW-020 — P6.3 to P3.5 — 54c
PHONE PLUG to MINIATURE PLUG

KW-030 — (P 6.3 to J 3.5) — 48c
PHONE PLUG to MINIATURE JACK

KW-040 — (P 3.5 to J 6.3) — 48c
MINIATURE PLUG to PHONE JACK

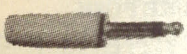
KW-050 — (P.RCA to J 3.5) — 48c
RCA PIN PLUG to MINIATURE JACK

KW-060 — (P. RCA to J 6.3) — 48c
RCA PIN PLUG to PHONE JACK

KW-070 — (P. 6.3) — 63c
CABLE PHONE PLUG

PHONE PLUGS

(AP 301) — POWER PLUG MATES WITH AJ302 — 19c



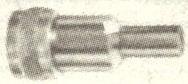
(AP 311) — 3.5mm PLUG MATES WITH AJ 311 — 15c

AP 320 — STANDARD PLUG — 30c

AP325	AS ABOVE BUT ALL METAL	51c
AP-330	STEREO PLUG 3 CONDUCTOR	55c
AP-335	AS ABOVE BUT ALL METAL	60c

KW-080 — 72c
MIKE CONNECTOR to RCA PIN JACK

KW-090 KW-091 — 090-58c 091-51c
MIKE CONNECTOR



KW-100 — 72c
(MIKE CON to J 6.3)
MIKE CONNECTOR to PHONE JACK

KW110 — 54c
PHONE PLUG to PHONE PLUG (6.3 to 6.3)

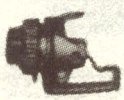
KW-130 — (6.3 JRCA) — 72c
PHONE PLUG to RCA PIN JACK

KW-140 — (J 6.3 to J 6.3) — 72c
PHONE JACK to PHONE JACK

KW-150 — (J 6.3 to J 3.5) — 61c
PHONE JACK to MINIATURE JACK

PHONE JACKS

AJ-302 — POWER SOCKET MATES WITH AP-301 — 26c



AJ-311 — 3.5mm JACK MATES WITH AP-311 — 13c

AJ-339	OPEN CIRCUIT JACK MATES WITH AP-320 OR AP-325	30c
AJ-319	CLOSED CIRCUIT JACK MATES WITH AP-320 OR AP-325	33c
AJ-331	OPEN CIRCUIT JACK MATES WITH AP-330 OR AP-335	48c
AJ-332	CLOSED CIRUIT JACK MATES WITH AP-330 OR AP-335	67c

KW-160 — 54c
RCA PIN JACK to RCA PIN JACK:

KW-170 — 3.5 to 3.5 — 54c
MINIATURE PLUG to PLUG

KW-180 — (P 3.5 to P RCA) — 54c
MINIATURE PLUG to RCA PIN PLUG

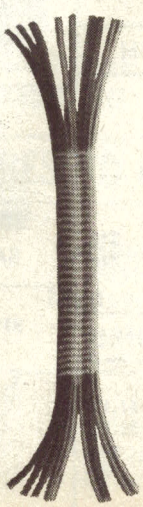
KW-190 — (J 3.5 to J 3.5) — 61c
MINIATURE JACK to JACK

KW-200 — (P 2.5 to J 3.5) — 48c
SUB-MINIATURE PLUG to JACK

KW-210 — 54c
RCA PIN PLUG to RCA PIN PLUG

KW 220 — (J 3.5 to MIKE CON.) — 65c
MINIATURE JACK to MIKE CONNECTOR

WOVEN FLAT RIBBON CABLE



TYPE A
9 Conductor
80c per foot

TYPE B
25 Conductor
$1.00 per foot

TYPE C
26 Conductor
$1.00 per foot.

All above are Multi-Stranded PVC covered colour coded wires. All have been tested to 2200v by the manufacturer.

JAYCAR COMPONENTS

PO BOX 39
HAYMARKET
NSW 2000.

DIN PLUGS

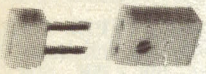
AP-920: 2P — 34c
AP-935: 3P — 41c
AP-945: 4P — 54c
AP-955: 5P — 55c
AP-965: 6P — 65c

DIN SOCKETS

AS-920: 2P — 22c
AS-930: 3P — 27c
AS-940: 4P — 28c
AS-950: 5P — 30c
AS-960: 6P — 32c

DIN LINE SOCKET
AS-956 58c
Mates with AP-955

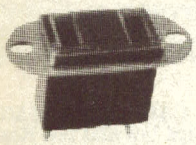
TV Feeder Connectors



AR-500 20c

AR-510 21c

2 PIN AC SOCKETS



AR-602 15c

VALVE SOCKETS

AS-401-9 pin 12c
AS-402-7 pin 10c

AS-420 COMPACTRON SOCKET 32c

AS-430 G. T. SOCKET 31c

AS-451  15c

TRANSISTOR SOCKET

RCA PIN JACK

AT-700 19c

CONNECTORS

4 PIN CONNECTOR PLUG 10c

AP-040

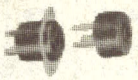
4 PIN CONNECTOR SOCKET 10c

AS-040

Plug And Socket Sets

SCREW MOUNT.

AR-030, 3 conductor 46c
AR-040, 4 conductor 51c



BRACKET MOUNTING

AR-130, 3 conductor 44c
AR-140, 4 conductor 48c

AR-170 (7 way) 59c
AR-190 (9 way) 64c

AR-430 (3 pin) 59c
AR-440 (4 pin) 66c

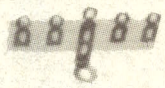
RCA Pin And Jack Strips

AT-630, 1 pin — 35c
AT-631, 2 pin — 40c
AT-634, 4 pin — 75c
AT-636, 6 pin — $1.00

Screw Terminal Strips

2 pin — AT 522 — 30c
3 pin — AT 523 — 33c
4 pin — AT 524 — 44c
5 pin — AT 525 — 47c
6 pin — AT 526 — 66c

Terminal Earth Strips



MINIATURE
3 way 10c
5 way (as above) 14c
8 way 23c

STANDARD
3 way 8c
5 way 14c
8 way 24c

BINDING POSTS

Red, Black 10 M / M 6c

AE-101

Red, Black 12 M / M 19c

AE-110

Captive or Free Head

Red, Black 16 M / M 40c

AE-120

BANANA PLUG

Red, Black 13c

AY-301

Tip Jack for above Red, Black 14c

AY-351

ALLIGATOR GRIPS

Red, Black.

AY-420 (31mm) — 7c
AY-430 (45mm) — 8c
AY-440 (70mm) — 10c

BATTERY CLIP

Red, Black

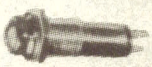
AY-451 (50mm) — 18c
AY-452 (60mm) — 24c
AY-453 (90mm) — 30c
AY-454 (90mm H.D.) — 40c

ARROW TYPE TIP

Red, Black For Posts

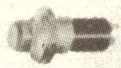
AY-201 12c

BEZELS



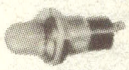
NEON Red, Green, Amber, Clear

AB-002 43c



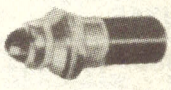
Red, Green, Amber with 6.3v Globe

AB-101 50c



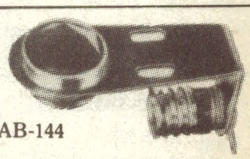
Red, Green, Amber with 6.3V Globe

AB-111 50c



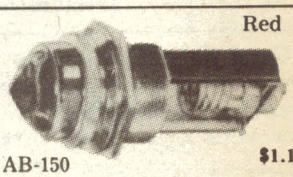
Red, Green, Amber without globe

AB-120 51c



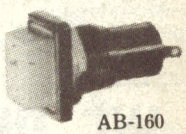
Red

AB-144 74c



Red

AB-150 $1.15



Red, White, Green 44c

AB-160

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AH-730

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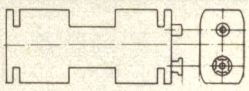
Cord Grip Grommets

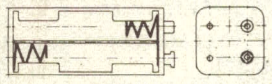
TYPE A — Suitable for 3 core flex 9c

TYPE B — Suitable for figure 8 types 7c

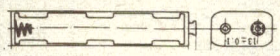
BATTERY CASES UM3



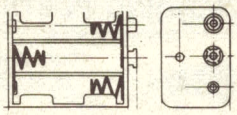
AH-900 UM 3 x 2 33c



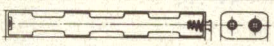
AH-902 UM 3 x 4 43c



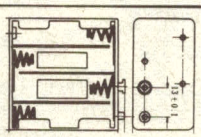
AH-904 UM 3 x 4 39c



AH-906 UM 3 x 6 65c

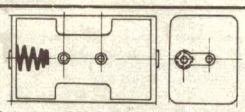


AH-908 UM 3 x 6 63c

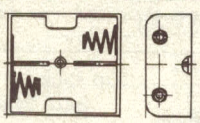


AH 909 UM 3 x 8 86c

BATTERY CASES UM2

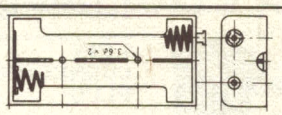


AH-910 UM 2 x 1 43c



AH-912 UM2 x 2 60c

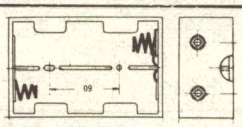
BATTERY CASES UM2



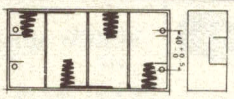
AH-914 UM 2 x 4 83c

AH-916 UM 2 x 4 79c

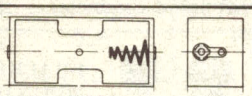
BATTERY CASES UM1



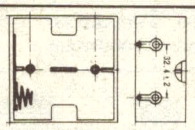
AH-922 UM 1 x 4 $1.40



AH-924 UM x 1 x 4 $1.40

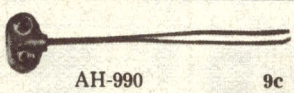


AH-918 UM 1 x 1 45c

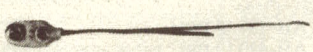


AH-920 UM 1 x 2 71c

BATTERY-SNAPS



AH-990 9c



AH-991 9c

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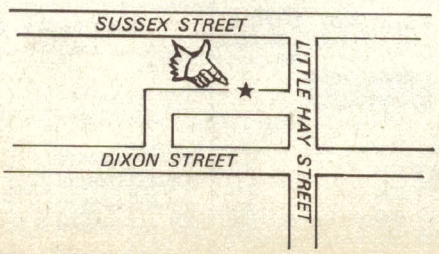
LOCATION MAP



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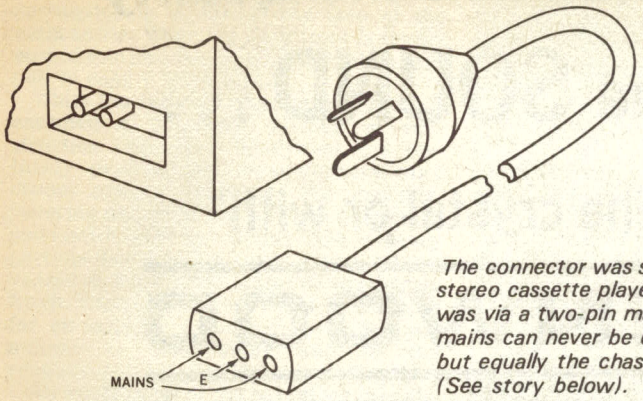
Power Connection - Oriental Style



The connector was supplied with an imported stereo cassette player where the power input was via a two-pin male socket as shown. The mains can never be connected to the chassis, but equally the chassis can never be earthed. (See story below).

a few days ago, while this article was being prepared.

The two male pins are protruding from the back of a stereo cassette player capable of operating from either 110/240VAC or batteries. The power cord was provided somewhere along the line between manufacturer and user. On one end is an Australian 3-pin power plug; on the other a 3-pin socket wired as shown.

While the latter socket is polarised in a rather vague way by slightly unequal spacing, it can in fact be forced on to the pins either way up and with the pins sliding into the centre and either one of the outer holes. But however it is inserted, the centre hole never gets the chance to earth the recorder chassis; it is always in the transformer primary circuit.

Obviously, the recorder will only work when the socket is so inserted that the pins connect between mains active and the power wiring earth!

The moral of all this is very clear. Don't take power cord connections for granted, particularly in equipment to which you're going to attach microphones, guitars or other metallic peripherals. Inspect the connections and check them with an ohmmeter to make quite sure that there is a circuit between the earth pin and the chassis, and NO circuit between the chassis and the mains supply pins.

One other point remains to be made. The trailing power cords attached to portable amplifiers take quite a beating; they are rolled and unrolled, kinked and unkinked, walked on and tripped over.

It is absolutely essential that they be checked from time to time and repairs initiated if they begin to look the worse for wear, particularly adjacent to the power point and the amplifier.

If a mains supply wire is fractured, the equipment will simply fail and the break must be mended. If an earth wire is fractured, the equipment will continue to operate normally — but without the vital safety protection that the earth wire provides.

Most important is the anchoring of the power cable inside the chassis of the amplifier. It must be firmly clamped so that it will resist either pulling or twisting without transmitting the movement to the electrical connections. A knot inside the chassis isn't good enough. It will resist any amount of pulling but it offers no protection against twisting.

In the face of all this, it is rather shattering to have to refer to a "technical hint" which one of our staff picked up recently from a group of "musos" in a discotheque: "If your amplifier hums, try snipping through the earth wire inside the chassis."

Good grief!

If you value your life, you'll use 3-core flex, — good 3-core flex. You'll make sure it is properly anchored and wired at both ends and you'll make sure that it is inspected and maintained.

And if you're using multiple amplifiers, you'll touch the peripherals from one against the peripherals from the other just to make sure. Better a test before the show than a tragedy half-way through!

Lest there be any misunderstanding, the problem here is not with people who built their own amplifiers. If they know enough to turn a circuit into a piece of operational equipment, they will almost certainly know the elements of safety and what the earth wire is all about.

"Almost"?

Rather tragically, another news item in the daily press, about the same time, recorded the death by electrocution of two electricians, one in a building, the other in a ship. Both died because they were working in a live-circuit situation.

This is nothing new to electricians. Occasionally they do it as a matter of necessity. Sometimes they do it because switching off the power would involve a degree of inconvenience. Sometimes they just don't bother.

Whatever the reasons, electricians usually get away with it because they know the hazards and they take care not to inject themselves into a circuit. Exactly the same remarks could be made about other workers in the electronics field who have to bypass safety interlocks in order to diagnose and correct faults in high-voltage equipment.

But no electrician, no electronic serviceman carries a certificate of immunity from electrical shock. For all his technical knowledge he will suffer the same fate as the most non-technical performer if he gets across a 240-volt circuit.

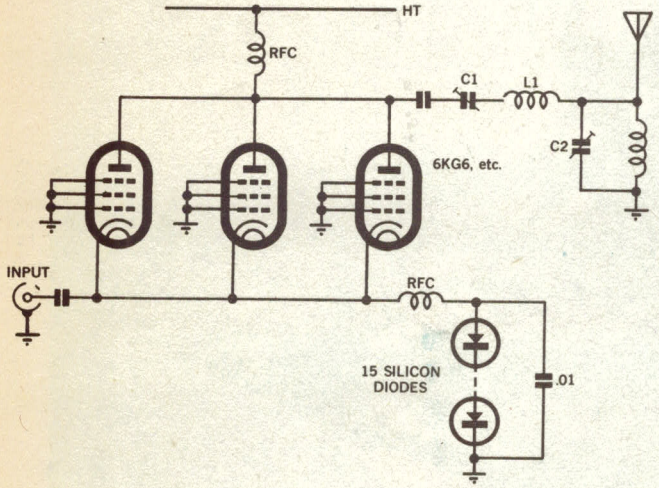
A morbid subject?

Sure! But none of us in the E.A. office laughed at the kind of news item I've just referred to. Or at the warning from the Chairman of the NSW Electricity Authority; or at the idea of cutting the earth wire in a portable amplifier system!

CIRCUIT & DESIGN IDEAS

Interesting circuit ideas and design notes selected by the Editor from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Contributions to this section are always welcome.

Linear Amplifier Tuning for 21 and 28MHz



Another approach to the problem of operation on 21 and 28MHz turns up in a note by Bob Baird, W7CSD, ("Ham Radio" August 1971). He considers that in high-power grounded-grid linear amplifiers based on multiple tetrodes or pentodes (where all the grids are strapped down to earth), the anode-to-earth capacitance of the valves becomes formidable, so that it can be difficult to obtain good efficiency at 21 and 28MHz. His solution is to connect the C1 of a conventional CLC pi-network in series rather than shunt with the inductor. It is important with this modification to ensure that both sides of this capacitor are isolated from earth (and from the user) as both sides are "hot" to RF. He reports that this modification has allowed him to increase his tank coil on 21MHz "from two very hot turns to six cool running turns".

The modified W7CSD linear also uses a string of 15 silicon diodes to provide a constant standing bias of 10V. He uses low-cost surplus 100PIV 1.5A silicon diodes as an alternative to the higher cost of a high-power zener diode, which could equally be used in this application. W7CSD comments that the conventional cathode bias resistor is a poor way of providing standing bias for a variable anode current amplifier.

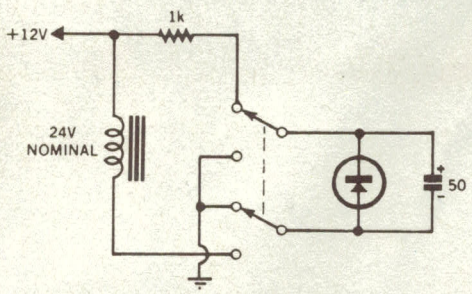
(From "Radio Communication".)

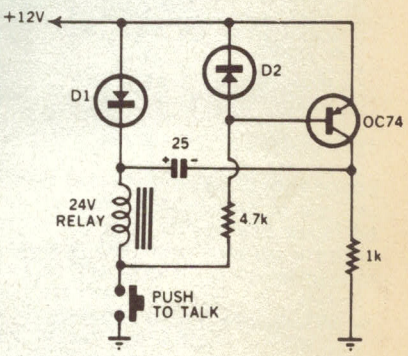
24 Volt Relays on 12 Volt Supplies

Many useful relays have 24V coils and would be used for transmit-receive switching for mobile work if they operated reliably on 12V supplies. Whether as part of the conversion of a 24V mobile for 12V use, or the use of disposals 24V relays this need arises in the shack.

All relays have three voltages of interest here — the nominal voltage of 24V, the pull-in voltage, usually 15 to 20V, and the drop-out voltage of 3 to 8V (for DC relays). If we apply over 20V for 20ms we will pull in a 24V nominal relay and 12V continuously applied will then hold the relay closed. This may be achieved by charging a capacitor to 12V and adding this to the 12V supply, giving a temporary 24V supply.

Using switches or a set of contacts of another relay a DPDT set is required, but usually only one contact with one side earthed is available in mobile push-to-talk microphones. One transistor, one diode and a resistor provide a pull-in circuit which eliminates the DPDT switch otherwise required. D2 can be a computer board type





or even a working junction of a dud transistor. D1 has only 12V PIV and must carry the (halved) relay current. It must not be a silicon type when the switching transistor is a germanium unit, as a Miller effect will then delay recharging of the capacitor.

The relay will take only one quarter of its rated coil power, and drop out more quickly than if at full voltage. The only warnings are that there will be a delay of a quarter of a second before the relay can be pulled in after dropping out, and that this circuit will result in reduced contact pressure in reed relays where the magnetic field passes through the contacts. In conventional relays the armature moves against a stop giving constant contact pressure regardless of the coil current, once it is closed.

(By VK6ZAF, in "West Australian VHF Group News Bulletin".)

Economical Quadraphonic Adaptor

At present, decoders suitable for matrixed four channel recordings tend to be rather expensive. Here is a circuit that can be built up for a very modest outlay. It will "de-code" most types of quadraphonic record such as EV, Project 3, Dyna, etc, as well as synthesising four channel sound from a normal stereophonic disc. Theoretically, it will not provide optimum rear channel localisation with the C.B.S. "SQ" disc but in practice the audible difference is only slight. In common with all four channel systems, an additional stereo amplifier plus two rear speakers are required.

Valves used for the unit are a pair of 12AU7 twin triodes. If the volume is found to be low in the rear channels, a 12AX7 should be substituted for the second valve.

Correct setting of the 100K and 2.5K potentiometers is important. These controls determine the front-to-rear and left-to-right separation. With the 100K potentiometer at maximum resistance and the 2.5K at minimum, the front-left and rear-left speakers receive identical signals, as do the front-right and rear-right. In other words,

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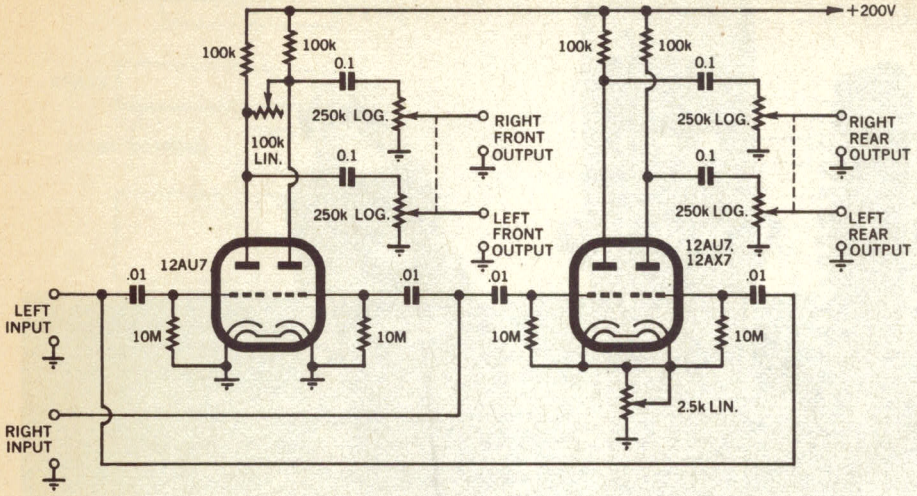


there is no back-to-front separation.

With the 100K potentiometer at minimum resistance and the 2.5K well advanced towards maximum resistance, we have maximum back-to-front separation but no separation between left and right front, or left and right rear.

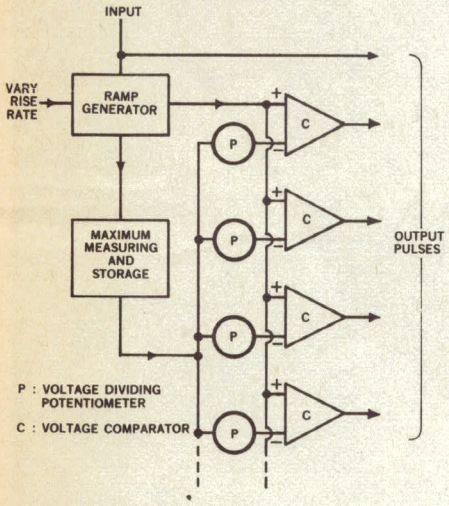
Compromise settings must be found that enable slightly different signals to be heard in each channel, to provide a quadraphonic effect. To accomplish this, the following procedure is suggested. Select a stereo recording that exhibits a wide separation and play it through the system with rear channels turned off. While listening from a point equidistant from the front speakers, adjust the 100K potentiometer to the lowest value at which separation is just noticeable. There should still be a sense of left-right location but not extending across the full distance between the speakers.

Next, turn up the rear channels and silence the front. Adjust the 2.5K potentiometer for barely noticeable separation. Increasing the resistance of this control too much should result in an out of phase mono sound! Now adjust the ganged volume controls for proper level in all four channels and the decoder is ready for operation.

(By Mr C. Slater, Box 22, P.O., Fairy Meadow, NSW 2519.)

(Editorial note: While we are not altogether happy with some of the finer points of this circuit, we publish it as an interesting item which could form the basis of experimentation for interested readers.)

An Analog Rhythm Generator



Some time ago I constructed a rhythm generator, the output of which could be switched to operate various sound production circuits — drums, bongos, etc. The speed was easily adjusted but it was difficult to adjust while playing another instrument and the impression was that of an inexorable taskmaster. What was wanted was a system which could detect the rhythm of a solo instrument and fill in any desired pattern of percussion.

Many players tap their feet while playing. A pedal could be used to operate possibly a microswitch but until at least two foot-taps have been made, the device cannot "know" the tapping speed. It has to do this and then divide up the period into selected fractions. For greatest flexibility the player ought to be able to select a number of desired fractions of the period and apply these to various sound generators.

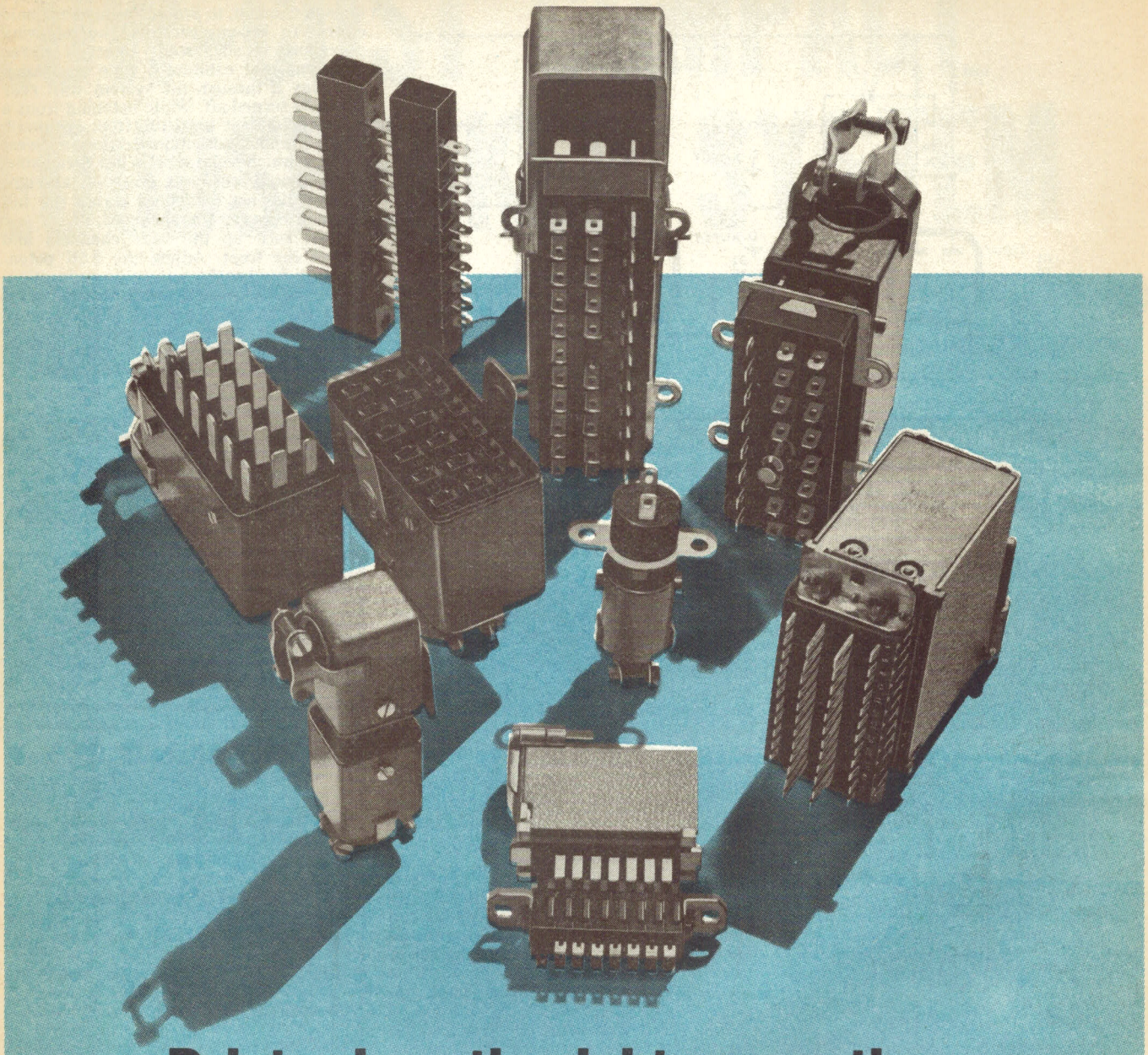
If a linear ramp voltage is caused to reach a maximum and return to zero at the moment of depression of a pedal, it will reach half this voltage at half the period. The method adopted was to cause the maximum ramp voltage to set an operational amplifier "memory", which would carry the same voltage throughout the succeeding period. A series of potentiometers, adjustable by the player, pick off selected fractions of this maximum. For each potentiometer there is a voltage comparator (eg, 710 series) which switches to give an output pulse when the rising ramp voltage reaches the preset fraction. Each output pulse can be routed to a specified sound generator.

The device will always be one beat behind, basing its rhythm on the time interval just elapsed. The ramp rise time can be adjusted by the player to suit the tempo but needs only a rough estimate, sufficient to cause a maximum voltage to work on without "bottoming" the operational amplifier.

The ramp generator is a type 741 operational amplifier with a capacitor feedback and a high value resistance input from a constant voltage source. This acts as an integrator and gives an excellent linear ramp. A similar operational amplifier acts as a memory. At the moment of pedal depression a relay or thyristor connects the ramp generator output momentarily to the memory output, thus setting it. Immediately after setting the memory the ramp generator voltage is made to fall to zero, again using a relay or thyristor. The time for these processes must be very short compared with the period between pedal operations.

There seens to be no limit to the number of outputs possible and strange rhythms can be selected, such as 5/4 or 7/4 time. Printed boards with resistors could be slipped into edge connectors to give preselected rhythms. There may also be applications for this principle in other fields.

(By Mr R. A. Hoare, B.Sc. (Eng.), 38 Dreadon Road, Manurewa, New Zealand.)



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The Multicon range is quality approved to DEF-5321; is available in combinations with from 2 to 33 poles and offers many improved features compared with types of similar construction. Contacts are heavily silver plated to ensure maximum contact efficiency. Split limb clips provide four individual areas of contact with each plug blade. Other features include moulded terminal numbering and moulded distance pips to avoid moisture build up between mated plug and socket which is instrumental in superior tropical performance.

The heavy duty Multicon range is basic to the Multicon range, and is designed to withstand extreme mechanical environmental conditions. Available in 7 contact combinations from 4 to 33 poles, the range incorporates the same mouldings, contacts and electrical specifications as the Multicon range.

A standardised range is available ex stock. Literature is available on request to the Professional Components Division.

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Receiver Alignment

The concept of alignment — why it is necessary — general techniques — tools required — the effect of AGC — instability — aligning IF stages — aerial and oscillator circuits — short wave alignment — alignment using instruments — television receiver alignment.

The inclusion of a chapter on alignment may seem rather out of keeping with earlier and more elementary material. However it is reasonable to assume that by this stage many readers will have tried their hand at building one of the receivers described in Electronics Australia or elsewhere, and may by now be facing up to this very subject.

Such being the case, it seems appropriate to do three things:

(a) Explain what is behind this matter of alignment and why it is necessary at all;

(b) Discuss some of the side-issues as, for example, dial setting, alignment tools and so on.

(c) Give an alignment procedure for a typical modern superhet receiver.

Even if the reader does not happen to have a receiver on the table, awaiting attention, the information should be useful and will be available against the day when it may be required.

Forty years ago, the word alignment was virtually unkown. For the most part, each tuning circuit in receivers of the day was brought out to a separate tuning dial and tuning involved turning each dial to the appropriate setting for the particular station. In fact, a standard accessory at the time was a card listing local stations, with two or three spaces alongside each, in which the set owner could insert the dial readings for optimum reception.

As time went by, designers sought to simplify matters by making all the tuning coils and capacitors as nearly identical as possible, so that the dial settings would correspond fairly closely. Thus, the owner could remember if he wished that a certain station came in with all the dials set to about 70, another station with the dials about 55 and so on.

From here, it was an obvious step to take even greater care with the tuning circuits and arrange them so that they could all be adjusted simultaneously by rotating a single tuning knob. At first, the individual tuning capacitors were linked behind the panel with gears or belts. Later they were combined into the one assembly as a two, or three or even four-gang capacitor. Thus "single-dial tuning" became the vogue.

Single-dial tuning has been with us ever since and is obviously a very convenient feature. However, several tuning circuits will not remain exactly in step — or "track" — accurately just because they are superficially alike. Special provision has to be made to ensure that the ganged tuning circuits all resonate to the correct frequency at each and every setting of the tuning dial.

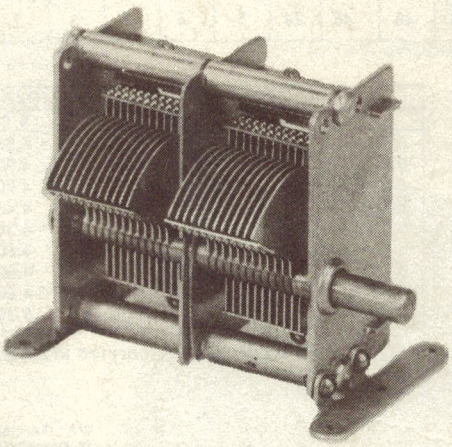
By very carefully maintaining the number of turns on the coils during manufacture and by matching the tuning gang sections, fairly good tracking can be obtained, as a matter of course, near the low frequency end of the range: that is, with the tuning capacitor plates well into mesh.

However, at the other end of the band, with the capacitor plates well out of mesh, the exact tuning of the circuits is affected, as much as anything, by "stray" capacitance — that to do with the position of the components, connecting leads and so on. Variation in this stray capacitance between one tuning circuit and another leads to tracking error at the higher frequencies, and therefore loss of efficiency.

To overcome this problem, it has become accepted practice to connect small trimmer capacitors in parallel with each tuned circuit. They are commonly adjustable between about 10 and 30pF. Sometimes they are separate components; sometimes included as part of the ganged capacitor.

Normal intention is for the trimmers to be set at about half capacitance, the tuning coils and the gang itself then being designed to cover the requisite band of frequencies — from about 1,700 to 535kHz for the ordinary medium-wave radio broadcast band.

If the stray capacitance across one or more of the tuned circuits happens to be a little high, then the relevant trimmer or trimmers are unscrewed a little. Conversely, if the strays happen to be low, the trimmer can be screwed in a fraction to increase the amount of capacitance to the anticipated figure.



A typical two-gang variable capacitor. Despite care in the manufacture of such units and the associated coils, the tolerances of these components plus stray capacitance effects make it necessary to align or "peak" tuned circuits operating from a common control.

Provided that the coils and gang sections are accurately manufactured, the tuning circuits thus aligned at the high frequency end of the band, remain reasonably in step over the whole tuning range.

In more recent years a further technique has been evolved which leaves even less to chance at the low frequency end of the tuning range. This involves the provision of an adjustable iron dust slug inside each tuning coil. Moving the core in or out of the winding changes the inductance by quite a large percentage.

Thus, in modern receivers, very accurate alignment can be achieved by adjusting the coil cores for exact inductance balance at the low frequency end of the band, and the trimmers for capacitance balance at the high frequency end of the band.

Note that the cores and trimmers perform different functions and they should always be adjusted to fulfil those basic functions. The fact that tuning circuits include variable iron cores therefore does not obviate the need for trimmers.

There is another facet to this matter of alignment which must be mentioned.

Originally, receivers used tuning dials simply numbered 0-100, leaving the set owner to memorise the tuning position for each station. Provided the receiver tuned over the necessary frequency band, the exact position of the stations within that band did not matter a great deal.

Thus trimmers could be set for proper tracking, without special reference to the dial reading. The only point which needed to be watched was that the trimmers were not all screwed in so far that they restricted coverage of the receiver at the extreme high frequency end of the band.

It is not necessary to refer to cores in this context because uncalibrated dials went out of vogue long before adjustable cores came in. Their use is covered however, later in the article.

More recently and, in fact, for many years, station call-signs have been marked directly on the dial scale. This means that the trimmer and core settings and the position of the pointer relative to the tuning gang shaft must be determined for accurate indication of the incoming station as well as for accurate alignment.

It involves also, one other important point. There is some variation from one type of ganged capacitor to another in the maximum and minimum capacitance figures and the shape of the moving plates. This affects the distribution of stations across the dial scale.

In an existing receiver, it can usually be assumed that the dial has been calibrated to

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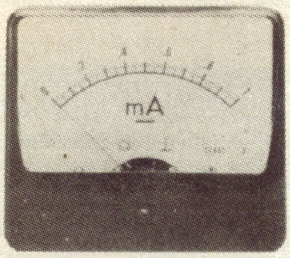

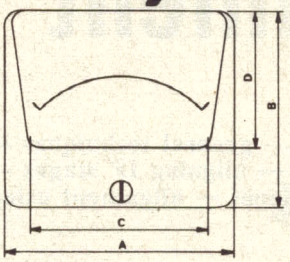

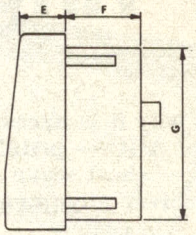

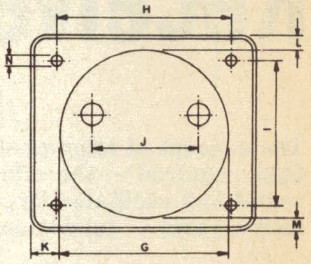

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
VP2A	75	65	62	44	10	25	56	48	48	30	10	6	3	3
VP3A	55	51	43	30	7	24	46	42	38	25	4.5	2	2	3
VP4A	46	43	38	25	10	22	38	33	33	21	4	2.5	3	2

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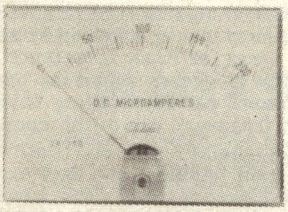
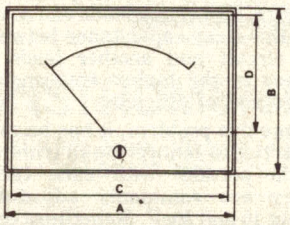
0-50uA DC
0-100uA DC
0-500uA DC
0-1mA DC
0-1mA DC (0-30V Scale)
0-5mA DC
0-10A DC
0-50mV DC
V.U.

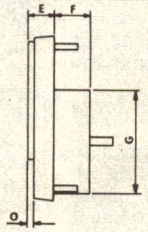
VP3A
0-50uA DC
0-100uA DC
0-500uA DC
0-1mA DC

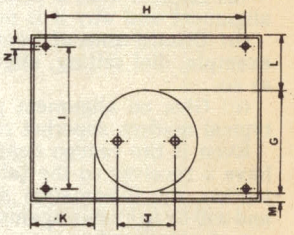
VP4A
0-50uA DC
0-100uA DC
0-1mA DC

T.D. SERIES









Available in four models — T.D. 152 — T.D. 118 — T.D. 86 — T.D. 66.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
TD152	152	110	145	78.5	17	24	69	133	95.5	38	41	36	4	3	4
TD118	118	106	112	67	14.5	24	69	101.5	90.5	38	24	24	12	3	2
TD86	86	78	80	46	13	24	69	57	57	38	8	4	4	3	2
TD66	66	60	62	34	13	24	55	48	48	24	5	3	3	3	2

Ranges normally available from stock. 0-50 uA — 0-200 uA — 0-1mA D.C. available in all four models. These models can be rear mounted using the panel cut-out "C" and "D".

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0-100 uA	* 6.00	* 5.40	* 4.90	5.80	6.00	6.90	10.50
0-200 uA	6.00	5.40	4.90	5.80	* 6.00	* 6.90	* 10.50
0-500 uA	* 5.50	* 4.90	4.40	5.30	5.50	6.40	10.00
0-1 mA	* 5.40	* 4.80	* 4.30	5.20	* 5.40	*6.20	* 9.80
0-5 mA	* 5.60	5.00	4.60	5.40	5.60	6.40	10.00
0-10A	* 5.60	5.00	4.60	5.40	5.60	6.40	10.00
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match the particuler ganged capacitor and correct alignment should therefore bring the stations in on their calibrated positions.

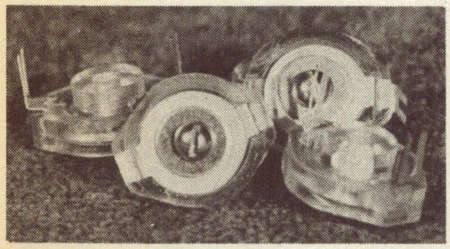
In a home-constructed set, however, there is a chance that a dial might be used having a scale calibrated for some gang capacitor other than the one used. In this case, no amount of manipulation of the cores and trimmers may succeed in getting all the stations to come in at the right positions on the dial.

In assembling components, constructors should therefore see to it that the dial scale is for the type of gang capacitor selected.

In the case of a superhet receiver, there is more to alignment than merely getting two or three tuned circuits to track, one with the other. This much will be evident from our explanation in chapter 13, of the superheterodyne principle.

Alignment involves getting all the IF transformer windings resonated to the appropriate frequency, usually 455kHz. It then involves getting the oscillator circuit to track with the aerial and possibly RF circuit, the requirement, in this case, being that the oscillator tune at all times 455kHz higher than the signal frequency.

This sounds a rather formidable task but the desired result can be achieved by following a fairly simple routine, which will be described later.



Trimmer capacitors come in various shapes and sizes. These illustrated have a clear polystyrene base and measure about ¾in diameter. As the screw is turned clockwise, it forces the top springy plate down, increasing the capacitance between it and the fixed plate beneath.

By now, the reader should have a fairly clear idea as to what alignment is all about. It should be equally clear that a receiver which has not been aligned cannot operate efficiently, because its various tuning circuits will be a long way out of step.

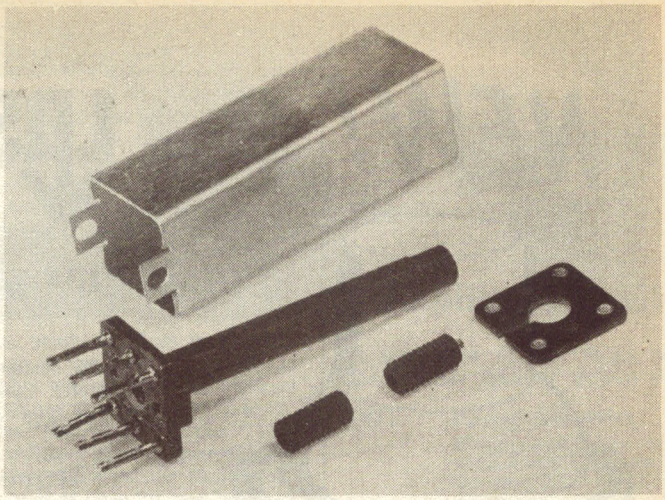
So much for section (a) — why alignment is necessary. Now for a few of the side-issues.

In a factory, receivers are aligned with the aid of a signal generator and an output meter and there is no doubt that the most accurate job can be done in the shortest time with their aid.

Since this is essentially an article for beginners, however, we do not plan to say overmuch about alignment procedures using such instruments.

The average home constructor is likely to have to rely on broadcast stations for a source of signal and to rely on his ears to indicate whether an adjustment has brought about an increase or a decrease in sound volume. Nevertheless, providing care is taken, quite good alignment is possible by these means.

If the alignment is to proceed smoothly, a few preliminary points must be checked.



The mechanical components of a typical IF transformer. The alignment slugs are threaded to screw directly into the central former. The hexagonal hole in the ends of the slugs is to take a special alignment tool.

Firstly, there is the action of the dial mechanism and the setting of the pointer relative to the dial scale and tuning gang plates.

If the receiver has a simple 0-100 dial scale with no station call sign marked, it is only necessary to see that the dial drives the tuning gang smoothly between the full-in and full-out positions and that the pointer travels over the scale with any overlap about equal at the two ends.

The pointer travel can be corrected in some dials by loosening a screw or slipping the drive cord through a loop. In others, it involves loosening the grub-screws locking the dial to the gang shaft and retightening the screws with the two in different relative positions.

With dials having the stations marked on them, the position is rather more confused. Because the capacitor plates are specially shaped precise tracking can only be expected if the pointer and its travel is locked to the gang shaft in one specific position — that for which the dial was originally calibrated.

With the two in the wrong relative positions, stations may be brought to correct calibration at the two ends of the bands by manipulation of the cores and trimmers, but those near the centre may be displaced slightly one way or the other.

Some dials — but not many — have a "dial set" line marked just beyond one end of the scale. The intention is that the dial shall be locked to the gang shaft with the pointer set to this reference line and the gang plates either full in or full out, depending on which end of the scale is involved.

Where there is no "dial set" line, the pointer can only be locked in a likely position and the alignment procedure followed out. If the stations can duly be made to fall in the calibrated positions, the pointer can be left set; if not, the pointer may have to be reset slightly one way or the other in relation to the gang shaft and the alignment procedure repeated, noting whether the new position has improved matters or otherwise.

Before going further, make sure that the dial will rotate the capacitor between the limits of its travel without obstruction, or straining the cord in a cord-drive type. If there is any such trouble, it should be corrected before spending time over the alignment.

In cord-drive dials, the tension of the cord is also important. If it is too loose, the cord will slip. If too tight, it may bind and ultimately break. In general, it is best to have the cord twisted twice around the control knob shaft, with the tension no higher than necessary to ensure positive drive.

Depending on the receiver, a special alignment tool may or may not be required.

Many trimmers are adjustable with an ordinary small metal screwdriver. As a rule, they are connected into circuit so that the screwhead makes contact with that trimmer plate which returns to earth or to the "earthy" side of the circuit. If touching the trimmer with a metal screwdriver alters the signal level, the chances are that it has been installed the wrong way round.

The trimmers in many early type IF transformers are likewise adjustable with a small metal screwdriver. Fingers should be kept off the shaft, however, and the blade kept clear of the metal can, because the trimmers on the plate side often connect internally to the HT circuit.

Iron cores are often adjustable also with a plain metal screwdriver, notably cores which are attached to threaded brass rods protruding from top and / or bottom of the shield cans. In some cases, where the threaded rods are not earthed, touching them with a metal object will affect the behaviour of the coil, making it difficult to pick the proper peak position.

To overcome this difficulty, a type of alignment tool has been available for many years having a very small metal screwdriver tip embedded in a moulded handle.

Alternatively, if the cores are not too stiff in their action, a suitable non-metallic screwdriver can be made by filing a piece of ebonite rod or an ordinary plastic knitting needle to the appropriate shape.

In recent years alignment "screwdrivers" have been made available of nylon or similar materials and these are also very handy for adjusting cores which have a screwdriver slot moulded directly into their ends. A still further type of alignment tool has a hexagonal end meant to engage a similar hole in moulded cores of a somewhat different type.

Irrespective of the core style and tool, however, it is wise to keep in mind that core adjustment systems are seldom very robust. If a slug has become jammed, don't try to force it. It may shatter or become detached from its brass shank (if any) or

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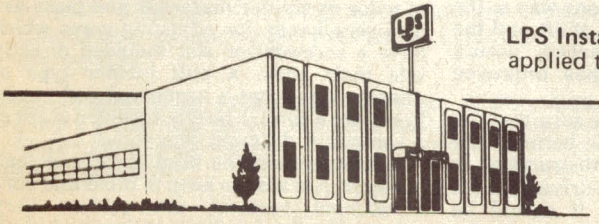

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the whole coil former may be twisted from its mountings inside the can.

From all the foregoing, most readers will have gained a fair insight into the broad principles of alignment, at least as far as the relatively simple TRF receiver is concerned. For this reason, and because TRF receivers are rare devices these days, we will devote the remainder of our discussion to the superhet.

Not long after the general adoption of the superhet, designers began to adopt also the technique of Automatic Volume Control, abbreviated commonly to "AVC." The general principle involved has since been extended to television receivers and other equipment concerned with the reception of signals other than those from the "entertainment" radio stations, and a more appropriate modern name for the technique is Automatic Gain Control — "AGC" for short.

In an ordinary broadcast receiver the AGC circuit is usually fairly simple. A DC control voltage, developed by the detector across its load resistor, is fed back as a bias voltage to one or more of the amplifier devices in the tuning section — RF amplifier, converter or IF amplifier.

On weak input signals, very little bias is developed by the detector or fed back to the controlled stages, so that these stages operate at almost full gain.

With stronger input signals, however, the detector develops a great control voltage and this, fed back to the controlled stages, reduces quite drastically the gain or amplification.

As a result of this quite automatic action, the receiver operates at full gain for weak signals but at much reduced gain for stronger signals. "Blasting" and overload effects are largely eliminated, together with at least some of the fading experienced when listening to distant signals.

A volume control still needs to be provided, of course, but it normally operates in the audio system. It allows listening volume to be set to the required level and adjustment to be made for any residual difference between weak and strong signals, not fully compensated by the AGC system.

AGC has much to recommend it from the user's point of view. However, it does complicate alignment somewhat and for a fairly obvious reason. With the receiver tuned to any given input signal, the AGC voltage attains a level depending on the strength of that signal and the gain of the receiver.

Now, if adjustment of a trimmer should increase the effectiveness of a tuned circuit, the resulting increased signal at the detector will produce more AGC voltage. This will decrease the gain, making the effect of the trimmer adjustment much less apparent than it would otherwise be.

Conversely, an adjustment which reduces the effectiveness of a tuned circuit will also reduce the AGC voltage and allow the gain to rise in consequence.

In other words, an AGC circuit in a receiver tends to mask the effect of any adjustments, and quite substantial changes in the efficiency of a tuned circuit through peaking might make only a slight audible difference in the loud-speaker output.

The best way to counter this masking effect is to align such a receiver on very weak signals, as from distant transmitters. Unfortunately, during evening hours, when most homebuilders would want to work on a receiver, there is often a hopeless confusion of weak signals between the strong locals, most of them subject to fading effects which can be most misleading.

If you have to rely on stations for alignment, the best plan is to carry out a rough alignment procedure on local stations to make the dial track correctly, leaving fine adjustment of the trimmer, etc, to some daylight period when it should be possible to pick up a couple of weak but steady signals at the respective ends of the band.

Out of all this comes one of the golden rules of alignment. Peak all receiver circuits as far as possible on weak input signals, advancing the volume control, if necessary, to make them audible.

So much for AGC action and its complicating effect on alignment. Now for a few words on instability.

In a well-designed receiver it is possible to peak all adjustments for optimum performance, without any complication arising. Each adjustment merely increases the gain and sensitivity till it reaches the maximum of which the set is capable.

In some cases, however, poor design, wrong choice of components, wrong placement or long active leads may allow an excessive amount of signal from one or more stages to couple into an earlier point in the circuit, producing a positive feedback or regenerative effect.

As the gain is increased by progressive adjustments, the receiver may suddenly become unstable or "burst into oscillation," to use another very common phrase.

Oscillation in a large receiver sounds much the same as oscillation in a small regenerative receiver, except that it is produced deliberately in the latter case and controlled by the "reaction" knob.

Instead of the station signals being heard clearly, each one is accompanied or even blotted out by a loud whistle which varies in pitch as the set is tuned across the station carrier.

Many superhets produce faint whistles on odd stations, particularly when operating near powerful transmitters. They are fairly distinct, however, from the strong whistles on every station produced by instability. And while a set is unstable, complete alignment is impossible.

The cure for instability in most cases involves elimination of the cause — improved design if the circuit is of doubtful origin, use of the proper components or rearrangement of the wiring and layout.

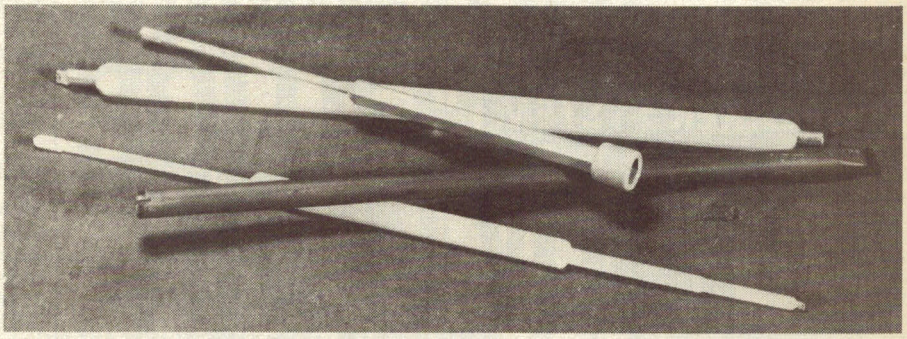
Needless to say, this is good argument for care in the first place, when building a receiver, whether it be a TRF or superheterodyne.

So much then for instability or oscillation.

The basic principles of a superhet receiver have been explained in an earlier chapter and do not require further elaboration here.

It is sufficient to recall that the incoming signals are passed through a conventional aerial (and possibly RF) coil, then heterodyned with a signal from a local oscillator stage to produce a resultant known as the intermediate frequency.

Matters are arranged so that each incoming signal, as it is tuned, is changed to the one intermediate frequency — usually 455kHz. All transformers in the IF amplifier section therefore need to be peaked to this figure.



A selection of alignment tools used for adjusting radio and television receivers. They are normally non-metallic, or use a minimum of metal, to minimise any effect on the circuit being adjusted by the proximity of the tool.

Fortunately, the task of aligning a superhet receiver is not as difficult as it might appear at first encounter and a home constructor can do a passable job of alignment without instruments and without help, provided a certain routine is followed.

First connect the set to an aerial and earth, preferably the ones with which it is to be used; connect the speaker and switch the power on. Tuning across the band, you will probably be able to hear quite a few stations, if the set is otherwise in order.

Try to find a weak but steady station near the low frequency end of the band.

Tune the receiver as accurately as possible to the station you choose. The best way to do this, or in fact to make any of the adjustments about to be described, is to rock the setting backwards and forwards over the correct point, gradually converging on it.

You can now adjust the IF transformer cores or trimmers as the case may be (most modern IF transformers have core adjustments) for maximum sound output from the speaker.

It is possible that what was previously a weak signal now becomes a strong signal as the sensitivity of the receiver rises. This being the case, do the best you can on the original station, and then tune accurately to a weaker adjacent station and go over the procedure again.

The IF windings do not usually need to be peaked in any special order but be sure not to miss any. There may be a slight amount of interaction between the adjustments, so it is a good idea to go over the IF adjustments a second time.

When you have finished with the IF transformers they should be fairly close to

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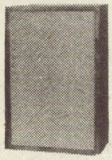

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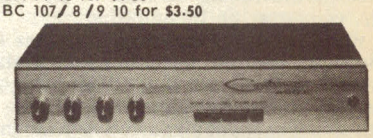

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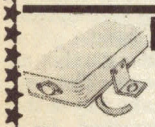

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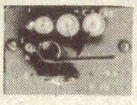

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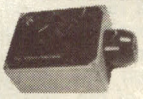

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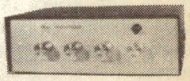

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the nominal frequency. This is 455kHz for most receivers nowadays, but occasionally you will strike a receiver with a different arrangement.

For this method of alignment it doesn't matter and, further, even if you do finish up a few kHz off the specified frequency, it will not be serious. The main thing is that all IF circuits be accurately aligned to the one frequency.

Having satisfactorily completed the alignment of the IF amplifier it remains to adjust the aerial and oscillator circuits. If your receiver has an RF amplifier stage, the adjustments for the RF coil are exactly the same as for the aerial coil.

With most modern receivers the adjustments consist of trimmers and variable slugs associated with both aerial and oscillator coils, and the padder or tracking capacitor is a fixed mica type.

In the case of the variable slugs, tune to a station which you can easily identify toward the low frequency end of the band and adjust the oscillator coil slug until the station coincides with its position as marked on the dial.

Then tune to a station toward the high frequency end of the band and adjust the trimmer associated with the oscillator section to bring this station to its correct position on the dial. Repeat the above adjustments a couple of times because each adjustments does have some effect on the other.

If everything is in order, ie, the dial and tuning capacitor correctly matched, all stations should now coincide with their marked positions on the dial.

Should the AGC system tend to make the strong local stations appear broad it would be in order to remove the aerial or operate the set with a short length of wire while making the adjustments to the station positions.

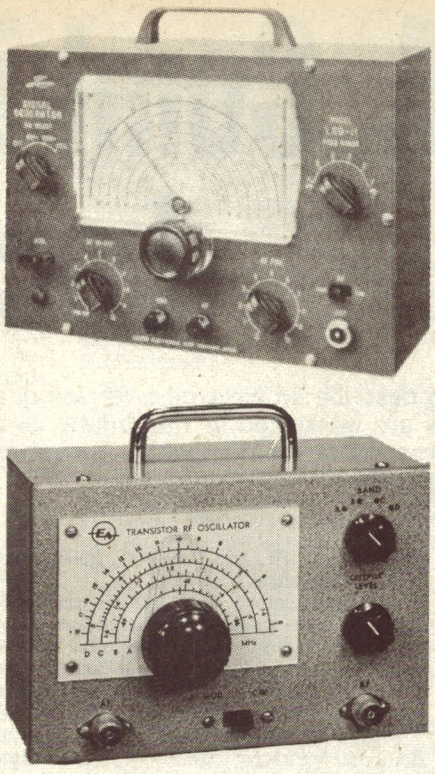
Finally, the aerial coil slug and the aerial trimmer should be adjusted to obtain the strongest signals. The slug adjustment should be made with the receiver tuned toward the low frequency end of the band and the trimmer adjustment toward the high frequency end.

The aerial circuit should preferably be adjusted with the aerial with which the receiver is to be used connected, and it is a good idea to go over it several times to make sure that you get the best results.

In passing it should be noted that many modern portable and "mantel" receivers do not have an aerial or RF coil of the type used in older sets and more elaborate modern receivers. Instead they employ a "ferrite rod aerial", or "loopstick", which performs the function of an aerial as well as that of an input tuned circuit. By their very nature, the inductance of these aerials cannot be varied over more than a small range, but this also means that they tend to require little if any adjustment. If needed, however, the adjustment is performed by sliding the coil along the ferrite rod.

By this time the set will probably be very sensitive, and you may not be able to find exactly the sort of signal you require. In this case it is quite in order to tune the set off a station and adjust for the greater noise output.

Modern aerial coils are designed so that the alignment is little affected by the aerial be it long or short, but some of the earlier aerial coils may not be above reproach in this respect. In any case we suggest that you do the final adjustment of the aerial trimmer with the aerial connected.



Typical RF signal generators. At top is a commercial unit, while immediately above is one of our more recent designs.

It may be worth mentioning in passing, that some broadcast band superhet receivers have no padder capacitor, either fixed or variable. The necessary tracking between the aerial and oscillator tuned circuits is ensured by having dissimilar sections in the tuning capacitor. The aerial (and possibly RF) tuning section is normal but the oscillator section plates are smaller and differently contoured.

The alignment procedure is exactly as set out for the fixed padder type of receiver.

To this point we have spoken only of the broadcast band. The procedure for the shortwave band or shortwave bands is essentially the same, but there is the added difficulty that it is often hard to find and identify a suitable station for alignment.

Conditions vary a great deal, and sometimes change within a matter of minutes. Therefore, do not be discouraged if first results are not very satisfactory. Of course, the aerial is more important than in the case of the broadcast band, because you frequently wish to listen to very weak signals. However, shortwave stations are heard strongly in Australia, and even a poor aerial will often receive them at considerable strength.

Another problem is that most conventional dual-wave receivers will "double spot" on strong signals. Double spotting is due to the fact that the local oscillator can produce the required 455 kHz beat when it is in either of two conditions — 455 kHz higher or lower than the wanted frequency. Thus, a second spot is always twice the IF (910 kHz in this case) away from the correct dial setting.

While the simple aerial tuned circuit will easily reject the second spot on the broadcast band, it is inadequate on the short-wave bands, and a strong signal will inevitably be found at two points on the dial. For alignment purposes, and assuming normal circuitry, the setting having the higher frequency of the two is almost always the correct one.

An excellent source of signals for short-wave alignment and frequency calibration of receivers are those radiated by standards stations such as the American WWV and WWVH, and the Australian station VNG in Lyndhurst, Victoria. Generally WWV and WWVH are heard in Australia at good strength on 5MHz, 10MHz and 15MHz, while VNG may be found on 4.5MHz, 7.5MHz and 12MHz.

The signals from these stations can easily be identified by the audio tones which are superimposed on the RF carrier and the fact that the tones are interrupted by a one-second pulse. There are interruptions at regular intervals for call sign announcements and other purposes.

If suitable test instruments are available, of course, a more precise job can be made of alignment. As we said earlier, we are not so much concerned in this chapter with readers who are sufficiently advanced to own or have access to test instruments, but a brief explanation may help the beginner understand what it is all about.

The best instrument for alignment is a modulated oscillator or the more elaborate instrument which usually goes under the name of a signal generator. These instruments can produce radio frequency signals anywhere in the spectrum required for alignment and the strength of the signals can be controlled by turning a knob on the front panel.

The signal is modulated usually by a 400Hz tone, so that when reproduced by the receiver a single whistling note is heard from the loudspeaker. With a signal thus available at any desired frequency, at any desired strength and producing a constant output tone, alignment is much simplified.

The alignment of television receivers involves special techniques and special equipment and in no circumstances should beginners tamper with TV tuners or IF systems.

Unlike the tuned circuits in broadcast receivers, those in a television receiver are not peaked for maximum gain. They have to be adjusted to pass a band of frequencies, from 5 to 6 megahertz wide, over which the audio and video signals from a television station are distributed. If the tuned circuits in a TV receiver were simply peaked in the normal way, the receiver might well become unstable. In any case it would produce only a poor picture, with no sound, or sound with little or no picture.

Even the sound channel in a television receiver is "special," involving a frequency modulated signal, as distinct from amplitude modulation used by ordinary broadcast stations.

Alignment of picture IF channels in a television receiver is normally performed with the aid of a "sweep and marker" signal generator and a cathode-ray oscilloscope.

The alignment problems inside a television tuner are even more complicated than for the IF systems, such that tuner alignment is rarely attempted other than at the factory or at special tuner service depots.

Elementary Electronics

A Combination Lock

By Ross Tester

We have had a number of requests to describe an electronic version of a combination lock. While most readers are interested in this purely as a novelty exercise, there is no reason why some of the ideas which it involves should not form the basis for a practical unit.

The combination lock has been around for a long time. Most of us would have seen movies of "expert" safecrackers with their ears to the safe, listening as the tumblers clicked into place, and then dramatically opening the door to reveal the inner treasures.

Maybe the tumblers are not all that easy to hear in reality, a fact which movie makers would doubtless ignore. Nevertheless, a lock which is completely silent in operation, and which can be built from readily available electronic components, makes an interesting project.

We plan to present a lock such as this. As well as the features mentioned above, it has the added advantage of an alarm function which would sound at the first wrong move. Also, the combination is relatively easy to change — unlike the mechanical variety.

While presented basically as a beginner's exercise, the project could have more serious applications. Suitably engineered it could form the basis of a genuine security lock, and we will have more to say about the actual lock mechanism later on.

At a less serious level it could form the basis of a game of chance at a typical charity fair. Contestants could be offered so many tries for, say, 10c and anyone fortunate enough to "crack" the combination and open the safe would receive the prize it contained. Considering the odds, the organisers could afford to be fairly generous in regard to the prize.

Let us look at the broad concepts of such a lock. Basically, we need a device which will allow a mechanical device to activate when, and only when, the information given it is correct in every respect. If any of the information is incorrect, the device should be able to warn of this fact.

A very simple system of logic circuits is able to do this. If the term logic is new to our younger readers, it is the field which embraces number systems and control using electronics. Naturally, computers fall into this class. In fact, some of the things in the electronic combination lock will be found in every computer.

These are the so-called "gates". As the name implies, a gate is a two state device — it can be only open or shut. The state of the gate depends on two things — the type of gate it is, and the information fed to it.

There are three main types of gates, namely AND, OR, & NOT. A refinement of the first two are the NOT OR, commonly called the NOR, and the NOT AND, commonly called the NAND.

As we said before, gates have two possible states. These states are known by many names, including on-off, true-false, and so on. The usual way of showing them is by the use of the figures 0 and 1. 0 corresponds to off or false, and 1 corresponds to on or true.

Figure 1 shows simple circuits used to demonstrate gates, together with their logic symbols. Figure 1a is an AND gate. As can be seen from the circuit, the lamp will light only if switch 1 AND switch 2 AND switch 3 are closed. Figure 1b, on the other hand, shows that the lamp will light if switch 1 OR switch 2 OR switch 3 is closed.

In other words, an AND gate requires all inputs to be at 1 before the output will be at 1. Alternatively if any of the inputs to an OR gate are at 1 the output will be at 1.

We are not concerned with the other types of gates for this project. In passing, however, we might mention that a NOT gate merely complements an input. In other words, if the input to a NOT gate is 1, the output will be at 0, and vice versa. NAND and NOR gates are derived from the NOT gate.

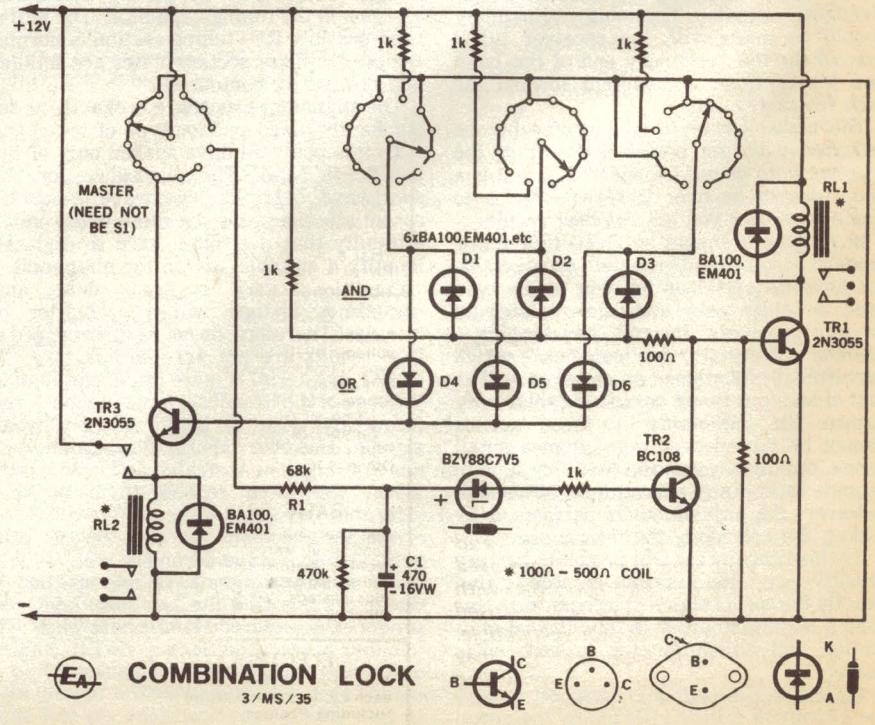
If all inputs to a NAND gate are at 1, the output will be at 0, and vice versa. Similarly, for a NOR gate, if any input is at 1, the output will be at 0.

We will be using both the AND and OR gates in our alarm. The AND application will become obvious immediately. The OR application we will describe a little later.

The simplest concept of an AND gate lock is an extension of figure 1a, where a number of switches are connected in series and, by reason of this arrangement, in themselves constitute the AND gate. In place of the lamp we can use an electrically operated lock, a relay to control such a lock, or a power transistor to control a relay etc. Each arrangement would have its particular advantages. (Figure 2.)

If we use, say, four 12 position switches, with a random position selected on each switch, we have over 20,000 possible combinations, other than the right one.

In certain applications, such an arrangement can be very useful. For example, it can be used, not to operate a



Circuit of the electronic combination system. If an actual lock is not required, the supply voltage may be increased somewhat to allow higher resistance relays to be used.

lock, but to disable an alarm system to permit legitimate entry. In such a situation, a would-be intruder has only one chance to get the combination right. If he fails the alarm will sound and he gets no second chance.

However, where such a circuit is used to operate a lock directly, the would-be intruder can have as many chances as he likes, the penalty for failure being nothing but wasted time. If he could work undisturbed, he would have a good chance of finding the combination by systematic trial and error.

The circuit which we have worked out below should be impossible to defeat. We say "should be", because nothing like this is absolutely 100% safe. However, the odds of someone cracking this combination are virtually infinite. It would be easier to win the Opera House Lottery, play four of a kind, and back every winner at Randwick — all on the same day!

As well as a combination, the lock incorporates two other safety factors. If the wrong dial is moved first, an alarm will sound — so it is not enough to learn the combination. Secondly, even if the right dial is correctly set at the first attempt — which is very unlikely — the user is given only a short period in which to set all the other dials. If he takes longer than, say, 10 seconds, the unlocking mechanism is bypassed, and there is no way the lock can be made to open.

The period of setting time is best determined by the user. Anything from a few seconds to a few minutes is possible for this delay.

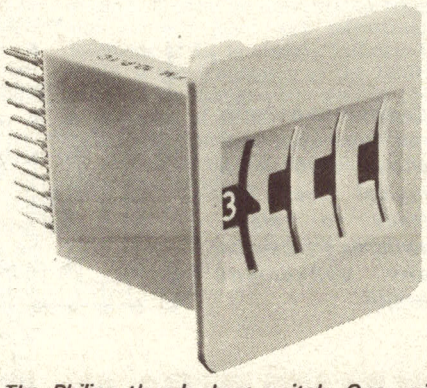
PARTS LIST

TRANSISTORS etc
2 2N3055 or similar
1 BC108
8 EM401 diodes
1 BZY88/C7V5 zener diode
RESISTORS (½ W)
1 470k
1 68k
5 1k
2 100 ohms
CAPACITORS
1 470uF 16VW electrolytic
MISCELLANEOUS
1 Relay, 100 to 500 ohm coil, 1 set normally open contacts
1 Relay, 100 to 500 ohm coil, 2 sets normally open contacts
4 Rotary or thumbwheel switches, see text
Suitable alarm (if required)
Suitable lock (if required)
Tagstrip, hookup wire, solder etc.
ADDITIONAL PARTS FOR POWER SUPPLY (optional)
1 power transformer, 240V to 12V 1A. (A&R2155, 6978 etc)
5 EM401 diodes
1 470uF 25VW electrolytic
2 6V Lantern batteries (Eveready 509 etc)

Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, providing the ratings are not exceeded.

If the owner should accidentally take too long to complete the sequence he will, of course be locked out also, but we have arranged matters so that the circuit will restore itself after a certain time, which can be selected by the user.

Now we can examine the circuit in more detail. The extreme left hand ("master") switch is wired differently from the other three. Once this switch is set the alarm is disabled, because the power for the alarm relay (RL2) and transistor (TR3) is supplied via the wiper and contacts of this switch. Once this is broken by setting the wiper to the correct position, the alarm is disabled.



The Philips thumbwheel switch. One unit only is shown on a four unit facade.

Incidentally, while we have shown the master switch in a particular position, for reasons of circuit convenience, the actual position which it occupies relative to the other three, should be chosen by the constructor. Then he, and only he, will know which knob to operate first. Thus the position of this switch becomes a part of the total combination.

The other three switches are wired with their moving arms connected to an AND gate made up of three diodes, D1, D2, and D3. The combination number is connected to the 12V positive rail and the remaining contacts to the negative rail.

At this point readers may wonder why we have used diodes to provide the AND gate, rather than simply using the switches themselves, as in the same manner shown in the example in figure 1a. The answer is that, while such an arrangement would be quite practical as far as this part of the circuit was concerned, it would prejudice the use of the additional protective circuitry we have already mentioned.

The operation of the diode AND gate is quite simple, and it will help the reader if he understands its operation. As shown in the circuit, it consists of three diodes with their anodes joined. This junction is the output of the AND gate. The three cathodes are the three separate inputs to the gate. The output connects to the positive rail via a current limiting resistor, and also connects to the base of TR1.

In normal use (that is, with the switches set off their combination number) the cathodes of the three diodes are at negative rail potential. Therefore, they are forward biased and they conduct. Their anodes are only slightly positive with respect to the negative rail (the voltage across the diode), and the output is regarded as being in the 0 state.

As each switch is set to its combination number, the cathode of the associated diode is switched from the negative rail to the positive. Therefore each diode ceases to be forward biased, and stops conducting. When the last switch is set, no diodes are conducting. The voltage at the output of the gate (anodes) rises substantially towards the positive rail voltage, and this shift constitutes the change from 0 to 1.

The increase in voltage is enough to turn on TR1, thus pulling in the relay. We used a 2N3055 power transistor in this project, rather than a BC108/relay combination which we have used in earlier projects. The main reason was that a number of readers have informed us that relays which pull in at low currents are relatively hard to come by. This is rectified by using a transistor which can handle more current.

The master switch circuitry has another function besides controlling the alarm. It

also incorporates a time delay circuit, consisting of a resistor (R1), capacitor (C1) and a zener diode. It functions as follows: The resistor restricts the rate of current flow and the rate at which the capacitor charges. As the capacitor charges, the voltage across it rises until it reaches a point where the zener diode conducts.

This turns on TR2 (BC108), which "steals" the bias which would otherwise have allowed the power transistor to turn on and pull in the relay. Therefore, the lock cannot be opened after this time delay has occurred. If the legitimate user is caught by this trap, he has to wait until the capacitor discharges through its parallel resistor until he can try again.

The alarm circuit consists of TR3 (2N3055), relay RL2, three diodes D4, D5, and D6, plus a few minor components. TR3 is connected between the positive rail, via the master switch, and the negative rail, with RL2 in the emitter circuit. The base of TR3 connects via a suitable limiting resistor to the output of an OR gate made up from the three diodes.

These three diodes are connected to the three combination switches in such a manner that, if the moving arm of any switch is set on, or passes over, its combination number, the positive rail voltage is applied to the diode, which becomes forward biased, and so to the base of TR3. This turns TR3 on, the relay closes, and the appropriate set of contacts operates the alarm. A second set of contacts between the positive rail and the base of TR3 by-passes both the switch and TR3, thus keeping the bell ringing despite any manipulation of the switches.

Note that only one diode needs to be forward biased in order to turn on TR3. This can be either D4 or D5 or D6; hence the term OR gate.

Now that we have explained the electronics of the combination lock, we can have a closer look at the mechanical aspects. Naturally enough, the switch mechanism represents the most important part of the device. We understand that a number of manufacturers market switches specifically intended for purposes such as ours. These are known as "thumbwheel" switches, and are operated by turning a numbered wheel which is mounted edge-on through a facade. It is a simple matter to operate these, and select the correct number very quickly.

We obtained one of these switches from the Philips organisation, and used it to formulate our original ideas. However, they have one major drawback — a four section switch would cost well over twenty dollars. Therefore, they could be seriously contemplated only in a commercial installation — such as that for a factory, office, etc. Here, the high initial cost would be more than offset by the reliability and dependability of the devices.

The type number of the Philips thumbwheel switch is 4311 027 82320. These switches also require a facade for mounting, which should be ordered at the same time as the switch.

For those who are more interested in building the combination lock as a novelty, we recommend conventional rotary switches, single pole — 12 position. These can be a miniature type, such as the Jabel model.

Ideally, these switches should have non-shorting contacts (ie, break-before-make) to avoid complications when switching between contacts at different voltage levels. Unfortunately, the more readily available and lowest cost types all tend to use shoring contacts (make-before-break) so we have gone to a good deal of trouble to design the circuit in which complications arising from their use are virtually eliminated.

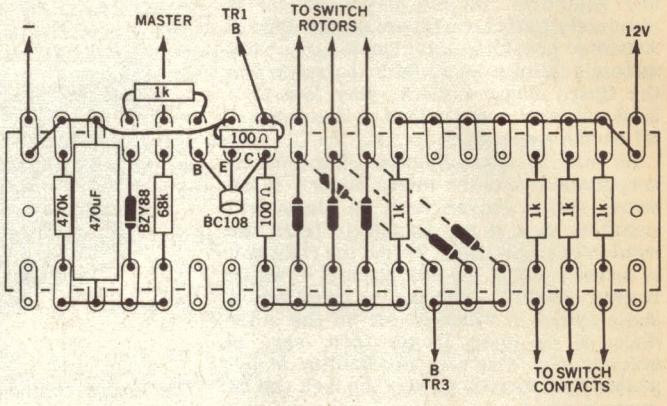
Electrically operated locks may be new to most readers, but they are readily available. The well known Yale company market several models under the trade mark "Yale Elettra". A typical price would be around twenty dollars.

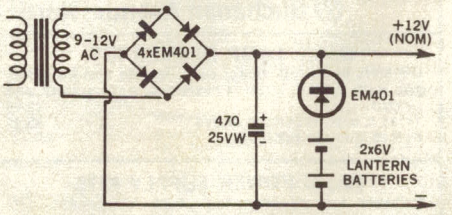
The bolt is normally spring loaded in the locked position, and is withdrawn when power is applied, and only for as long as it is applied. They are available for 12V operation and require a current of between 800mA and 1A.

This information was supplied by the Australian importers, Glen Carr & Partners Pty Ltd, Quirk Rd, Balgowlah, NSW, 2093. They should normally be available from the larger hardware and builders' supply stores. If difficulty is experienced, the importers should be contacted directly.

The power supply required for the whole system depends on a number of factors. The basic circuit, as shown, can be operated from a relatively simple supply such as a pair of lantern batteries. In the

Component layout is not critical but that shown here is a logical one. The leads to relays, switches etc may be any convenient length.





Basic circuit for a mains power supply with automatic battery standby.

Elementary Electronics Ideas Worth Trying

Emergency Ammeter

The writer was recently faced with the need to check the behaviour of his car's electrical system, in particular whether the alternator was capable of carrying all the load which could be imposed on it — headlights, mobile radio gear, etc. — even when the engine was only idling.

As no ammeter was available, either in the car or as a separate item, this presented a problem. The final solution is so simple, it may appeal to others.

A multimeter, set to the 0-1mA range (also 100mV in most meters), was connected between the chassis terminal of the battery and the chassis proper or, in other words, directly across the lead from battery to chassis. While the resistance of this strap is low, it was reasoned that there would still be a small voltage developed across it when several amps were flowing through it.

Switching on the headlamps gave a deflection of about three minor divisions (6mV) — not much, but enough.

Then the engine was started and run at idling speed. The pointer swung back past zero, indicating a charge condition. Reversing the meter connections sent the pointer up the scale a couple of divisions, even with all auxiliary circuits switched on, indicating that the alternator was not only supplying all these, but charging the battery at a significant rate also.

While there is no suggestion that this is a substitute for an ammeter, it is a quick and easy way of checking the system's behaviour.

---

locked position there is a steady drain of about 12mA and in either the unlock or alarm position the drain will depend mainly on the resistance of the relays used in these circuits. Assuming typical relays of about 500 ohms the operate drain for either condition would be about 25mA.

Power for the associated devices, such as the alarm or power operated lock, presents more of a problem. A heavy duty alarm may require 1A or more and need to operate for a reasonable period if it is to be effective. As already stated, the lock will require a similar current, but with a shorter duty cycle.

This kind of power can be supplied by dry batteries, and the two lantern batteries already mentioned may be adequate in some cases. However, these would be right on the lower limit.

Mains power is an alternative, but has some objections. One is that an unauthorised person may attempt to beat the system by cutting off the power. This will, in fact prevent the lock from operating, but it will also disable the alarm, which may be undesirable in some circumstances. Another objection is that a power failure may prevent legitimate entry, although some locks have a mechanical override using a conventional key.

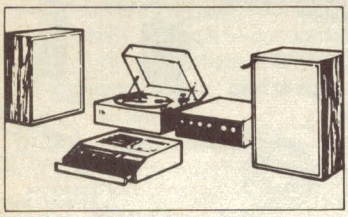
A good compromise appears to be mains operation with battery standby. This is quite easy to arrange and has a high order of reliability. As shown in the circuit, the mains supply consists of a transformer and rectifier delivering a little more than 12V. The standby battery is permanently connected, but isolated from the load by means of a diode, which is reversed biased so long as the mains supply voltage is higher than the battery voltage. If the mains supply fails the diode is forward biased and the battery takes over without any break.

Adjustment of the time delay circuitry is simple. The 68K series resistor gives a time delay of around thirty seconds. To shorten the delay, one of two changes can be made. The 68K resistor can be replaced with a lower value — a 22K should give around ten seconds delay. Alternatively, the zener diode could be replaced with one of lower voltage. A lower voltage zener does not require the capacitor to charge as long to reach the zener point.

Using the lock is very simple. However, always make sure the master is the last switch un-set, otherwise the alarm will sound. Also, it must always be the first switch set, for the same reason. Remember the time delay, too. If the correct combination is set, and the lock does not operate, un-set all switches (the master last) and wait for about thirty seconds. This gives the capacitor time to discharge. Then, the setting can be commenced again.

Another ingenious Sony idea.

TC-146 stereo tape deck that's a portable mono cassette-corder, too!



Here's Sony's latest novel and neat combination! TC.146 is the tape deck with 'legs' — the go anywhere stereo tape deck that functions independently — a mono portable cassette-corder when you need it. The 1.5 watt output TC.146 in an elegant walnut finished cabinet has built-in carrying handle, electret condenser, microphone, built in 4-inch speaker and built-in Sony precision all the way. Features include ultra modern head gap and low-noise, low-distortion for wide frequency response, high signal to noise ratio. Tape end alarm, too. About $210.

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- Tape speed: 1⅞ ips
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- Maximum recording time: 120 min. with C-120 (both sides)
- Circuits: 20 transistors, 1 FET, 7 diodes
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CLASSICAL RECORDINGS

Reviewed by Julian Russell

Roussel symphony — "important first recording"

ROUSSEL — Symphony No. 2 in B Flat Major. For a Springtime Festival. French Radio Orchestra conducted by Jean Martinon. Record Society Stereo S / 6402.

This is an important first recording of a seldom played symphony originally from the Erato catalogue. You will not find it easy to appreciate or even understand at first hearing, though nowadays it presents no harmonic or melodic difficulty despite its often harsh dissonances. The first movement has almost agonised striving of youth towards the "rewards" of maturity. The next energetic section — we are still in the first movement — is still overshadowed by the worries and pain of adolescence. Violent efforts are made to shake off the gloom by almost unbearable torment. There are brighter moments in the second movement and even some bouncy rhythms but generally speaking the work is in a dark humour though I never found it the slightest bit depressing.

The symphony is coupled with Pour une Fete de Printemps, originally intended as its scherzo and played here with great verve by Martinon and his French orchestra. It provides an excellent 12-minute fill and is in sprightly contrast to the prevailing mood of the symphony. The orchestra responds with a keen sense of Roussel's primary colours and though there is sometimes too much resonance in the bass end of the recording the general effect is satisfactory. Two works that I am sure will grow on you with repetition.

★ ★ ★

BRAHMS — Piano Quartet in G Minor. Emil Gilels (piano) with members of the Amadeus Quartet. DGG Stereo 2530 133.

This interesting early work is seldom heard either on disc or in the concert hall because many listeners — and players — find its form strange and even bewildering. However these players' perceptive approach, backed by their peerless playing and a recording rich in tone and perfect in the balance between the piano and the strings, should help greatly in understanding and appreciation of the work. If it still sounds formally a little odd to our present-day ears, appreciation and enjoyment is helped enormously by the players' urgent and impassioned performance of the first movement.

After this, the second movement (allegro) is introduced with almost incredible delicacy. Here is an enchanting diversion between the thrust of the first movement and the amazingly original andante, a slow movement in the unexpected shape of a slow minuet, with a martial sounding trio in the middle. But the shape is so subtly disguised that its originality might well pass unnoticed by all but the most attentive listeners.

The final rondo goes like a whiz. You will find no puzzle here in the wonderful rhythmic treatment and above all in Gilel's virtuosity in the outstanding but never too aggressive piano part. No praise could be too high for all four musicians taking part in this revealing performance. Listening to them, I felt I understood this quartet for the first time. But don't go to it expecting any Delibes-like charm. There are plenty of sturdy bones in its structure.

★ ★ ★

STRAVINSKY — The Firebird. Complete Ballet. French National Radio Orchestra conducted by Lorin Maazel. Concert Hall Stereo SMS 2710.

This always gorgeous score of Stravinsky is played here with stylish attention to its rich orchestral detail, both in the playing and recording. Maazel conducts most of it at "ballet" tempos though there is an occasional exception. The entrance of the princesses is a shade slower than it would be in a theatre but sounds very sweet just the same. It might incommode dancers but it's fine on the ear. Then again the Dance of the Golden Apples goes a little on the fast side but is played with immaculate brilliance. The Ronde des Princesses also tends to drag a wee bit and thus loses a little of its dreamy lyricism. But things return to normal with the urgent tritone that ushers in the excitement to come with the entrance of the evil Koschei and his grotesque servitors. Their ensuing dance is wild but never reckless and its constantly changing beat is always under perfect control.

This over you have the tender poetry of the Berceuse with its fully scored passages really voluptuous in tone. The final Chorale builds up into a beautifully calculated climax leading to those wonderful last modulating brass chords. A very attractive disc.

★ ★ ★

MENDELSSOHN — Symphony No 4 (Italian). Four items from the incidental music to A Midsummer Night's Dream. Concertgebouw Orchestra conducted by Bernard Haitink (1) and George Szell (2). Philips "Universo" Stereo 6580 027.

On this budget-priced disc you have two great conductors directing the same orchestra. In the first movement of Mendelssohn's Italian Symphony the Concertgebouw gets along with a fine swagger in the sunniest of moods. Before his death last year Szell had developed a notable reputation for the accuracy and precision of the orchestras he conducted, though it is now a matter of history that he and the London Symphony never got on very well. So precise is the chording in the first movement of the Mendelssohn symphony that Haitink might be thought to be challenging Szell on his own ground. At any rate the playing is as aristocratically phrased and precisely attacked as anything the Cleveland ever recorded, when Szell was conducting.

Haitink keeps the march-like second movement moving according to the composer's instructions, andante con moto, though he sustains just the right pace to avoid either dragging or unseemly hurry. Graceful phrasing and a comfortable tempo gives the third movement a happy rustic air. It is all very musical and without any hint of a clinical exercise. Nor is there any mid-Victorian sentimentality. The Finale, a salterello, goes past like a flash without ever a note out of place despite its breakneck speed. The whole symphony provided me with much enjoyment.

Szell chose, not surprisingly, the Overture for his Midsummer Night's Dream excerpts, a teenage work that continues to work its miracles after nearly 120 years. He directs it with all his accustomed precision at the same time winning stylish delicacy from the Concertgebouw. The other three pieces date from a later period in the composer's life. The Scherzo is quite literally a marvel of exactitude. I thought the horn tone a little on the fat side at the opening of the Nocturne, but this is the type of tone popular in central Europe. The final Wedding March makes a brilliant conclusion, still full of vitality the way it is played here, no matter how often you've heard it in a concert hall, or on disc. Altogether a most attractive production for those who don't like to think too deeply about the music they're listening to.

★ ★ ★

THE ART OF THE TOWN PIPER—Edward H. Tarr and Ensemble of Ancient Instruments. Stereo, Record Society S / 6261.

You will find no Scottish or Irish piping among this collection of interesting musical antiquities. In fact there is not one item devoted to the bagpipes, an omission for which, frankly I feel no regret. The sleeve illustration shows a collection of five men, four of them playing, the other holding, unfamiliar looking instruments of the reed family. But where the players are named on the back of the sleeve you will learn that they are using such newly fashionable old devices as a positive organ, crumhorns, descant shawms and cornetts, the last not to be mistaken for the more modern cornet-a-pistons still used instead of trumpets by composers. The Oxford Companion to Music has a long article on the bagpipe family and town pipers but nowhere mentions the type of combinations used here.

Altogether there are 18 brief items in this recital many of them from the pens of 16th and 17th century composers whose names will probably mean as little to you as they do to me. But Scottish readers beware — there is nary a pibroch among the lot. Some of the little pieces are serious, some gay, some graceful, a few even dainty, with the old instruments offering many "novelties" in the way of timbres. Try the first item on Band 2 of the first side for the delectable buzzing of three crumhorns. Although all

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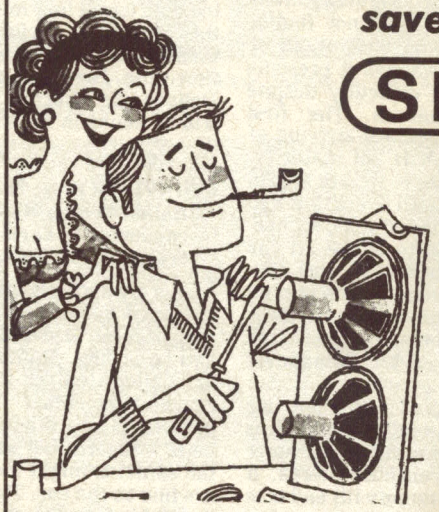

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pieces are scored for modest combinations you will not complain of lack of variety in this disc, which I found always interesting and often delightful. It is certainly unusual and commands much more than merely academic interest. So far as I could tell, all the pieces are expertly played.

CLASSICS AT BUDGET PRICES

Reviewed by Harry Tyrer

Julian Russell is recovering from the effects of an operation, and has not been able to provide his usual quota of classical reviews this month. We have used the available space to review some of the many classical releases now available at budget prices.

PIANO CONCERTO NO 1 and CONCERT FANTASIA IN G MAJOR — Tchaikowsky. Peter Katin, piano, with the London Symphony Orchestra conducted by Edric Kundell in the Concerto, and the London Philharmonic Orchestra conducted by Sir Adrian Boult in the Fantasia. Stereo, Decca (EMI) SPA 168, Series 275.

I know that Peter Katin is capable of some very fine performances, but his playing here is disappointingly dull in the Piano Concerto. The London Symphony Orchestra under Edric Kundell is not giving of its best either, and one gets the impression that this was not an entirely happy partnership. To cap it all, the sound is woolly, and this is particularly noticeable in the piano tone. If it is a good version of the Piano Concerto you want, my advice is to look elsewhere. There are enough to choose from, goodness knows.

The playing of both soloist and orchestra in the Concert Fantasia is much better, possibly due to the presence of the genial Sir Adrian Boult on the rostrum. But here again, the sound is far from satisfactory. Not a disc I can recommend, even at the budget price.

★ ★ ★

RAYMOND LEPPARD conducts the English Chamber Orchestra and the New Philharmonia Orchestra. Stereo, Philips 683035.

This special issue at the low price of $2.75 is intended as a sampler to introduce record buyers to the art of Raymond Leppard, who has made a large number of discs for Philips with the two orchestras featured here. However, it is by no means a "bits and pieces" type of sampler. Every item is a complete work, and they are all worth having. The contents are: Overture to "Catone in Utica" (J. C. Bach) — Suite in G from "Water Music" (Handel) — Sinfonia in E minor (C. P. E. Bach) — Sinfonia in B Flat (D. Scarlatti) — Harpsichord Concerto in F minor (W. F. Bach) — Symphony in D, K.196 / 121 (Mozart).

I have no space to deal with these items individually, but it should be obvious that in general they reflect Raymond Leppard's interest in the lesser played items. Indeed, only the Handel pieces are likely to be known to most buyers. The Mozart symphony is a short work, slight in stature, which presumably dates from his time at Salzburg with Archbishop Colloredo. However, they are all worth attention, and are splendidly played by the two orchestras. The recordings all date from the period 1968-70, and are consequently of good modern standard.

★ ★ ★

SCHUBERT — Trout Quintet. Jorg Demus, piano, and the Schubert Quartet. Quartet movement in C minor. Amadeus Quartet. Stereo, DGG Privilege Series 135 062.

Schubert's lyrical Trout Quintet must be easily the most popular, and certainly the most recorded, work in the chamber music literature. Accordingly there are numerous versions to choose from at all levels in the price structure, but this one on the prestigious DGG label, featuring such eminent artists, is certainly worthy of consideration. And whereas many versions take up two whole sides, this one has a generous fill by the inclusion of the passionate C minor quartet movement, played by the acclaimed Amadeus Quartet.

However, the main interest here is in the Trout Quintet. The performance is an entirely pleasing one, with no undesirable features. Jorg Demus plays fluently, and is admirably complemented by the quartet. However, the recording engineer has recorded the piano too prominently in places where it leads the other instruments, with the result that the stringed instruments are overshadowed. Otherwise, the disc is technically satisfactory.

★ ★ ★

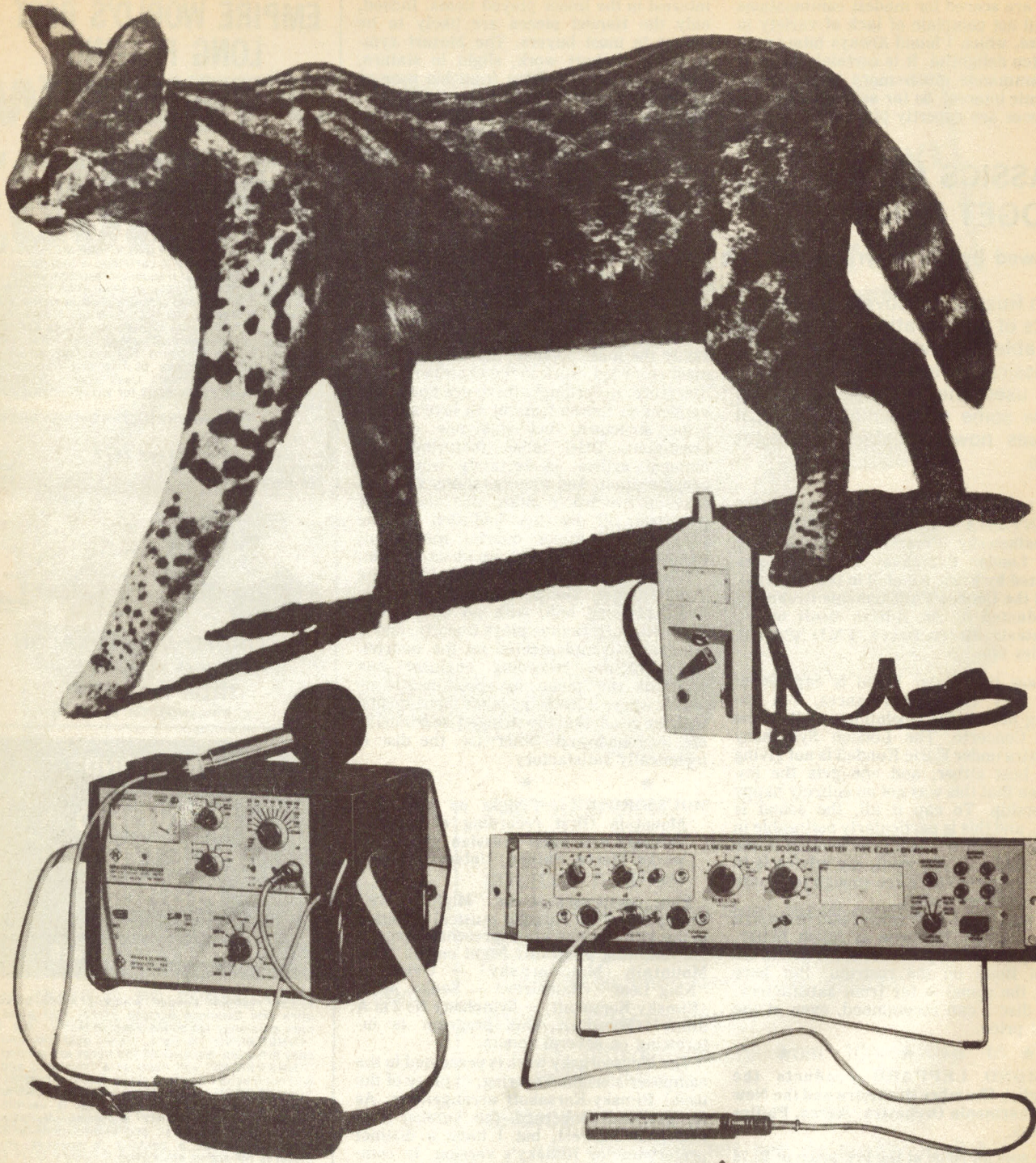
MOUSSORGSKY — Night on the Bare Mountain (first recording of original version) and other Russian orchestral works. Stereo, Philips "Universo" series 6580 053.

Four composers of the "Mighty Five" who founded the Russian musical tradition in the 19th century are represented here in the following program: Night on the Bare Mountain (Moussorgsky) — Overture "King Lear" (Balakirev) — Sadko, op. 5 (Rimsky-Korsakoff) — Symphony No 3 in A minor (Borodin). This program is interesting on several counts.

The Moussorgsky work is presented in the composer's original scoring, in place of the usual Rimsky-Korsakoff arrangement. As far as I am concerned, this version is of academic interest, but I have a distinct preference for Rimsky's version. In comparison, Moussorgsky's orchestration is less brilliant, but against this on can set the originality of his scoring, which achieves some interesting effects.

Rimsky-Korsakoff's "Sadko" op. 5 has nothing to do with the opera of the same name, from which the famous "Song of India" is the best known number. This purely orchestral piece was written in 1867 under the title "Episode from the Legend of Sadko" and was later revised and renamed "Musical Picture — Sadko". It is pleasant enough, but not one of Rimsky's best pieces, and the melodies are uninspired.

The two movement Borodin symphony was left unfinished by the composer, a habit of his which has resulted in a number of his



Many of us probably wish from time to time that the noise in our environment could be kept down to a level comparable to that of this wildcat padding past.

Sound level meters, such as these three instruments from the Rhode & Schwarz line, are aids in the battle against noise: the portable small Precision Sound Level Meter Type ELT, the portable and battery-operated Impulse Sound Level Meter Type EGT, which can be accommodated in a carrying case together with the Octave Filter PBO, or the Impulse Sound Level Meter Type EZGA, suitable for rack-mounting installations.

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works having been finished and orchestrated by other composers. In this case, the work was undertaken by Glazunov. It has a number of pleasing themes and the orchestration is well done in the typical Russian florid style.

Balakirev's "King Lear" overture offers some ten minutes of pleasant but unspectacular music, in which lyrical themes follow one another without seeming to lead anywhere in particular. It does not demand much of the listener, and I doubt whether you will remember much about it when it ends.

In summary, then, a disc of pleasing but mainly unassuming Russian music. The orchestra plays as competently as one would expect of such an experienced body.

For a budget price disc the sound is very good indeed. Worth considering if you have an interest in Russian music.

★ ★ ★

TCHAIKOVSKY — Violin Concerto in D. Michele Auclair, violin, with the Innsbruck Symphony Orchestra conducted by Robert Wagner.
Piano Concerto No 1 in B flat minor. Jacques Klein, piano, with Europa Orchestra conducted by Hein Jordan. Stereo, Fontana Gold Label Series (Phonogram Recordings) 6540 083.

This is obviously a fairly old recording, dating from the days when relatively unknown artists and orchestras playing standard classics commanded a ready market. Nowadays, buyers are much more particular about who they want playing such works — if they are prepared to pay the price. Despite the lack of big names here, this is excellent value at the $2.75 asked. In the first place, it offers two full scale works, both of which have often taken two full sides. And the two soloists, however lacking in fame they may be, both play extremely competently.

Jacques Klein is particularly good in the lyrical slow movement of the piano concerto, but could have used more bounce in the lively last movement. Michele Auclair copes with the technical difficulties of the violin concerto without any noticeable strain, but her tone becomes a little harsh in places. Both orchestras do all that is required of them under the guidance of their respective conductors.

I want to make it plain that these are not going to be my favourite recordings of either work, but those seeking to build up a library of classics at modest cost should find this recording very attractive, if only until they can afford something more prestigious. On the other hand, there is always the possibility that, having become familiar with these performances, they may want to stick with them.

Technically, the disc is typical of its period — about 1958 at a guess. The sound is clean but with limited dynamic range and lacking the realism and brilliance of today's recordings.

★ ★ ★

ALSO SPRACH ZARATHUSTRA and TILL EULENSPIEGEL — Richard Strauss. Stereo, HMV SOELP 9884.

If you like "Also Sprach Zarathustra" but could not be tempted by any of the numerous full price versions which appeared when the work acquired popularity through its use in "2001 — A Space Odyssey", this budget price reissue contains a very respectable performance of the work plus a generous bonus — the popular "Till Eulenspiegel". If you want a sonic spectacular, the Phase 4 version is for you (PFS 4202) but if clean but slightly dated sound will do, this disc is well worth $2.75.

★ ★ ★

RAVEL — ORCHESTRAL WORKS. The Concertgebouw Orchestra, Amsterdam, conducted by Bernard Haitinck. Stereo, Philips "Universo" series, 6580 055.

In a recent issue, I reviewed a CBS disc in which Boulez conducted this identical program: Daphnis and Chloe Suite No 2 — Pavane for a Dead Princess — Alborada del Gracioso — Rapsodie Espagnole. If you found the fare tempting, but hesitated at the price, here is a disc at budget price which, if not reaching the same heights as Boulez' performance, is certainly very satisfying. If I had not heard Boulez' sumptuous "Daphnis and Chloe" suite, I would have no reservations at all about this performance, but I am forced to admit that Haitinck, excellent conductor though he is, cannot equal Boulez in his subtle nuancing and delicate tonal shading. However, the choice is a fairly simple one — Boulez at full price, or Haitinck at budget price.

If you elect to chose the Haitinck, and have not heard the Boulez, I do not believe you will be disappointed. The sound is of good standard, with just a slight edge on the string tone which the ultra critical may find disturbing.

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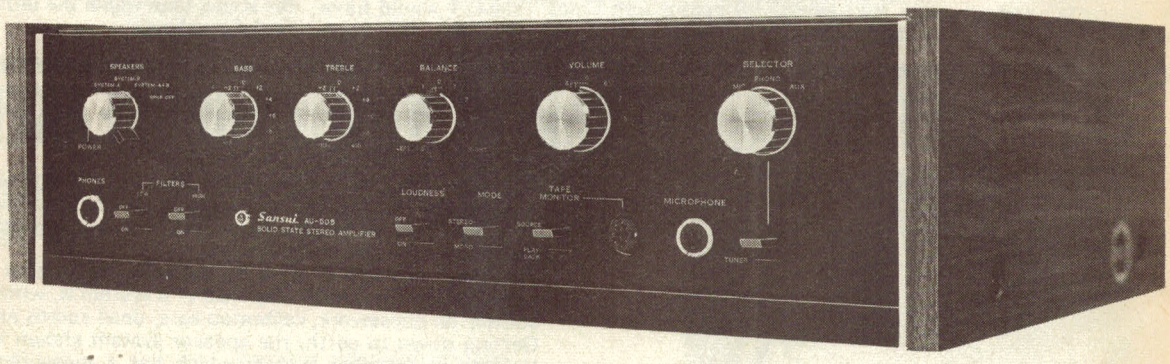

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Frequency response:	*20-40,000 Hz. ± 1 dB.*
T.H.D.:	*Less than 0.5% at full rated output.*
Channel separation:	*Better than 60 dB.*
Input sensitivity:	*2 mV. (magnetic pickups), 180 mV. (tuner, tape recorder, auxiliary)*
Dimensions:	*15⅝" x 11 x 5⅜".*
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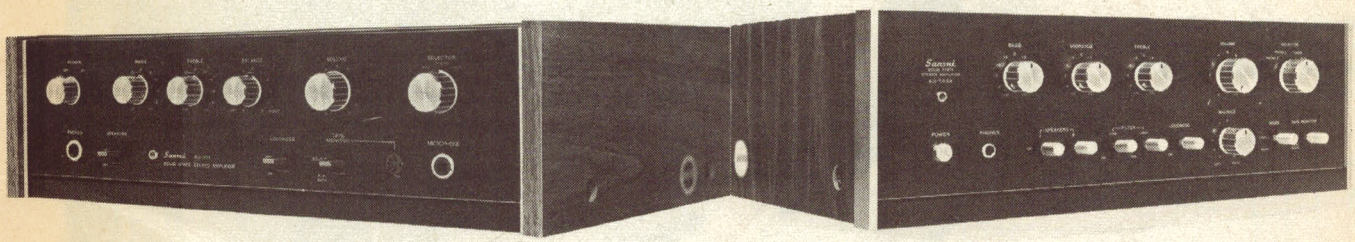

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VARIETY FARE

REVIEWS OF OTHER RECORDINGS

Devotional and Classical Organ

SING A SONG TO THE LORD. Myriam Frances, vocal with guitar. Stereo, Philips 833,550-PY.

Myriam Frances is a pseudonym for a lass who prefers not to be identified in any way. Backed mainly with guitar and percussion and using (I suspect) multiple recording techniques she presents a dozen of her own devotional songs. There's an ingenuous quality about the whole production, but a quality that is very deliberate. Most will find it rather charming:

Seek The Lord — God Is Dwelling In My Heart — Poverello — Mary — A Call To Christians — God Is Love — Author Of Beauty — In God's Family — A Cowboy's Friend — The Gift Sublime — Come, Follow Me — Sing A Song To The Lord.

Best you listen to a couple of tracks to test your reaction to Myriam Frances' style. (W.N.W.).

★ ★ ★

ANTI-BLUES. Delvin Ford. Stereo, Light LS-5566-LP. (Sacred Productions Aust, 181 Clarence St, Sydney and other capitals).

According to Delvin Ford, the cure for the blues is not a big bank account, a degree or the applause of an audience. It is the security founded on a faith in God. This is the message which he seeks to communicate in a dozen of his own compositions: Such Is The Day — By And By — Love Of God — Keep The Faith — Do You Know How It Feels? — Compassion — Destined Journey — Rhetorical Question — Awake, Sleeping Giant — I Want To Go To The Holy Land — God's World.

Delvin Ford has a light but pleasant voice, of folk style and relies on a modern guitar backing. While the songs will not be known to many, the diction is excellent and you will have no difficulty in following the words. While Delvin Ford has his sights mainly on an adolescent audience, his style should have a wider appeal than this. It makes pleasant listening. (W.N.W.)

★ ★ ★

ELGAR: SACRED MUSIC. The Choir of Worcester Cathedral, conducted by Christopher Robinson. Organ, Harry Bramma. Stereo, World Record Club WRC S / 5038.

A fine recording, this, of English cathedral music at its best. Much of it is in a spirit of gentle adoration and supplication but there are times when the voices blend in a massive anthem of praise. The magnificent organ lends its support and is featured in two brief segments with Christopher Robinson at the console.

Included are: Ave Verum — Ave Maria — Ave Maris Stella — Introduction and Andante from Suite For Organ — Angelus — Give Unto The Lord — O Hearken Thou — Allegretto Piacevole Intermezzo and Poco Lento from Suite for Organ — Te Deum and Benedictus.

The copious notes which are a feature of most WRC releases contain a short biography of the composer, indicating his early catholic background and later interest in Anglican liturgy. Also set out are the Latin words, where sung, and the English translations. "Angelus", "O Hearken Thou", "Give Unto The Lord" and "Te Deum" are all sung in English and the words are given.

I can recommend this album to anyone who has any interest at all in music of this kind. (W.N.W.)

★ ★ ★

JESUS CHRIST SUPERSTAR. Stereo, EMI AXIS 6020.

The only credits on this album are to librettist Tim Rice, composer Lloyd Webber and producer Walter Ridley. The identity of the orchestra, chorus or soloists is not revealed beyond the fact that the performance was recorded in England. In fact, the album is well up to standard musically and technically and certainly worth the Axis budget price to anyone who wants their own copy of this now very popular rock opera.

The track titles: Overture — Heaven On Their Minds — What's The Buzz — Everything's Alright — Hosanna — Simon Zealotes — Pilate's Dream — I Don't Know How To Love Him — Damned For All Time — I Only Want To Say — King Herod's Song — Superstar.

Jesus Christ Superstar is not everyone's music nor everyone's idea of devotion but this account of the music is quite okay if your budget will not stretch to the more pretentious full price or double-fold albums. (W.N.W.)

★ ★ ★

GREAT ORGAN WORKS. Nicolas Kynaston playing the Royal Albert Hall Organ. Stereo, EMI Axis 7001.

This is an album which should rate consideration for any organ enthusiast's collection of recordings. Even if you prefer organs and organ music of another kind, this is as good a "digest" as you are likely to find of a massive instrument and the music that has been written or adapted for it.

At the console is Nicolas Kynaston, still in his early thirties, but with a maturity rounded out by study under Fernando Germani and Ralph Downes. His technique and musicianship are hard to fault.

The program includes the following: Toccata and Fugue (Bach) — Canon in B-minor (Schumann) — War March Of The Priests (Mendelssohn) — Fantasie in E-flat (Saint Saens) — Grand Choeur Dialogue (Gigout) — Toccata in B-minor (Gigout) — Andante Cantabile, Symph. No. 4 (Widor) — Etude de Concert (Bonnet) — Carillon-Sortie (Mulet). Excellent jacket notes detail both the composers and the music.

The recording engineers must be commended. They have managed to contain the tremendous dynamic range of the instrument without noise or overload, though not all pickups may be able to cope with the big pipes. Mine did, and with what a result! Recommended, especially at its low price of $2.50. (W.N.W.)

Instrumental, Vocal and Humour

CONCERT A LA CARTE. Academy of St Martins in the Fields, conducted by Neville Marriner. Stereo, Philips "Universo" series 6580 066.

This selection of shorter classical items includes many which have found their way into the "Palm Court" repertoire, and are therefore often to be found in disc of "The World's Most Beautiful Classics" type, played by second class orchestras. There is certainly nothing second class about the playing of the Academy of St Martins in the Fields — quite the reverse. If, like me, you have an abiding affection for these tuneful pieces, you will appreciate the elegant way in which they are presented here. The titles: Trumpet Voluntary (Jeremiah Clarke) — Arrival of the Queen of Sheba (Handel) — Rondeau from "Abdelazar" (Purcell) — Moderato from String Quintet (Rossini) — Minuet (Boccherini) — Minuet from Divertimento in D (Mozart) — Serenade (Haydn) — Allegro from Trumpet Concerto (Haydn) — Andante Cantabile (Tchaikowsky) — Ballet Music No 2 from "Rosamunde" (Schubert) — Scherzo from "Midsummer Night's Dream" (Mendelssohn). Apart from a slight thinness of tone which is noticeable particularly in the violins in a few tracks, the sound is of good standard. A delightful record, which I shall be playing often. (H.A.T.)

★ ★ ★

LILAC TIME. The Sinfonia of London and the Linden Singers conducted by John Hollingsworth. Stereo, World Record Club WRC S / 2442.

"Lilac Time", woven around the love of Franz Schubert for a young Viennese girl, is notable for the way it is structured around many of Schubert's beautiful melodies. These certainly come through and the performance itself is not in question but I cannot register any enthusiasm for the actual recording. It is clean enough but it is notably lacking in dynamic range and in the

Reviews in this section are by Neville Williams (W.N.W.), Harry Tyrer (H.A.T.), Leo Simpson (L.D.S.) and Gil Wahlquist (G.W.).

bass end. My guess is that it is quite an old recording.

The tracks: Overture — Just A Little Ring — Hark, Hark, The Lark — Under The Lilac Bough — The Golden Song — Finale: Act 1 — Dance Of The Bridesmaids and Children — Serenade — My Sweetest Song Of All — Sextet — The Flower — Finale: Act II — When The Lilac Bloom Uncloses — Finale: Act III.

Just so-so. (W.N.W.)

★ ★ ★

FOUR-HANDED PIANO MUSIC — Schubert. Paul Badura-Skoda and Jorg Demus. Stereo, DGG 139 107.

I incline to the view that there is more pleasure to be gained from playing piano duets than listening to them. However, it is hard to imagine more persuasive advocacy for the art than is displayed here, or more pleasant music than that of Franz Schubert. This program contains the popular Military March in D major, with which most people will be familiar, but this is not an indication of the musical worth of this program. There are two fine pieces of Schubert piano writing in Fantasie in F minor and Grand Rondeau in A major, both of which contain examples of Schubert at his lyrical best. The program opens with Allegro in A minor, which I thought was not particularly interesting, and closes with Two Marches Characteristiques in C major, which are charming trifles.

The artists have a long history of co-operation, and I have noticed their names in other discs of piano duets. They play with complete understanding and mutal consideration. On the technical side, I thought the piano tone a little on the hard side, but whether this is to be attributed to the recording engineer or the artists, I cannot say. (H.A.T.)

★ ★ ★

CHOPIN'S GREATEST HITS. Van Cliburn, piano. Stereo, RCA Victor LSC-5014.

This is popular Chopin with a vengeance, and I must say that if I had to nominate a selection of pieces for anybody wanting a basic collection of Chopin's piano music, I should certainly include all these: Polonaise in A flat — Mazurka in B flat — Nocturne in E flat — Waltz in D flat — Fantaisie-Impromptu — Waltz in C Sharp minor — Revolutionary Study — Study in E flat — Preludes in A and D flat — Scherzo in B flat minor. I have not given the opus numbers, but this is hardly necessary — these are all the well know pieces found in countless recordings.

This series is of course intended for those with little or no prior knowledge of the composers represented, and as such niceties of interpretation can usually be disregarded. However, the playing of Van Cliburn here is worthy of the respect of even the most experienced listener, and if you have a need in your collection for some basic Chopin, this disc is well worth your attention. Van Cliburn's technique is more than adequate to meet the demands of anything he plays here, but over and above this I was struck by the absolute integrity which shines through his playing. Nothing is flashy or superficial, and the music is not pulled about by exaggerated rubatos. Although I have heard more performance of these items than I care to admit, I thoroughly enjoyed the disc.

Presumably the tracks have been culled from various recordings made over a period of years, and sound quality tends to vary, but is mostly very good, with adequate dynamic range. I noticed some distortion on peaks, and since my stylus does not usually exhibit inability to track, I am inclined to believe this is in the recording. (H.A.T.)

ALSO RECEIVED:

BRAHMS' GREATEST HITS. Has excerpts from Piano Concerto No 2, Symphony No 3, Symphony No 1; also Waltz in A flat — Hungarian Dances No 5 and No 6 — Rhapsody in G minor — Cradle Song. Sound fair to excellent.

RICHARD STRAUSS' GREATEST HITS. Excerpts from Also Sprach Zarathustra — A Hero's Life — Death and Transfiguration; also complete, Don Juan — Rosenkavalier Waltzes — Till Eulenspiegel. Sound good to excellent.

★ ★ ★

GREAT THEMES TO REMEMBER. Ronnie Aldrich and His Two Pianos. Stereo, Decca Phase 4 PFS-4233.

In this recording, made in association with the London Festival Orchestra, Ronnie Aldrich on piano highlights the main melodic theme, while a percussion group gently stresses the rhythm. The thematic treatment is strongly reminiscent of the original Warsaw Concerto.

The basic themes are well known and well loved: Mozart 40 — Meditation (Massenet) — Serenade (Schubert) — None But The Lonely Heart (Tchaikovsky) — Vocalise (Rachmaninoff) — Barcarolle (Offenbach) — Nocturne (Borodin) — Serenade (Mozart) — Nocturne (Chopin) — Air On The G-String (Bach) — Theme From Piano Concerto No. 21 (Mozart).

You may prefer this music in another form or you may have no use for yet another version. Fair enough! But my tip is that most will find the album thoroughly enjoyable. In its own way, the performance is impeccable and the recording is all that one has come to expect from Decca Phase-4. Well worth a hearing. (W.N.W.)

★ ★ ★

GOLDEN SOUNDS OF THE CLASSICS. Various artists. Stereo, Polydor 2371-237.

Here's another album which purists might disdain as schmaltz or jazzed up classical lollypops. But the fact remains that they are time-honoured themes, arranged and performed by very talented musicians. It would be crazy to deny their wide potential appeal, especially when they are conveyed via the skill of Polydor engineers:

Sabre Dance (Katachurian) — Minuet (Mozart) — La Traviata (Verdi) — Serenade (Schubert) — Hungarian Dance Nos 5 & 6 (Brahms) — Spring Song (Mendelssohn) — In A Persian Market (Ketelby) — Liebestraum (Liszt) — Serenade (Toselli) — Melody in F (Rubenstein) — Fur Elise (Beethoven) — Nocturne in E-Flat Major (Chopin).

Featured are James Last, Hans Carste, Alfred Hause, Kai Warner and their respective orchestras, the Orlando Or-

chestra and others. If you like music of this type — and it is very listenable — you will find it hard to choose between this one and the Ronnie Aldrich album reviewed elsewhere. You'll probably end up buying them both! (W.N.W.)

★ ★ ★

THE VENTURES PLAY THE CLASSICS. Stereo, United Artists (Festival) SUAL-934489.

Just about everybody is on the classics bandwagon at the moment, but most "modern" versions are tending to play straight with just a rhythm section to enliven the proceedings. The Ventures have always shown an imaginative approach to their music, and one is not surprised to find that their treatment of the classical selection here is rather more far reaching. They use their own musical phraseology to embellish the originals, so that in many instances the composer's melody is only a framework. The musicianship of the group is indisputable, and no doubt their numerous admirers will find plenty to enjoy here. However, those not familiar with the style who might feel attracted by the titles should be cautious, and a generous sampling is advisable before buying.

The titles as listed are: Beethoven's Sonata in C sharp minor — One Fine Day — In a Persian Market — Swan Lake — Bach's Prelude — Mozart Forty — Joy (Jesu Joy of Man's Desiring) — Elise (from Fur Elise) — Ravel's Pavane — Mozart's Minuet — Melody of Joy (from Beethoven's 9th Symphony). If you know your classics, you will probably have no problem in identifying most of these. However, I should point out that "Bach's Prelude" is not a prelude at all, but a minuet from a set of easy pieces Bach wrote for his second wife, Anna Magdalene Bach; and "Mozart's Minuet" is not a minuet (it is in 4 / 4 time) and is in fact from the first movement of the easy piano sonata in C major, the melody of which was popular some years ago under the title "In an 18th Century Drawing Room). Sound and stereo are both well up to modern standards. (H.A.T.)

★ ★ ★

CLOSE TO YOU. Franck Pourcel and his orchestra. Stereo, Axis (EMI) 6015.

Franck Pourcel and his grand orchestra will need no introduction to fans of the "easy listening" programs on commercial radio. His arrangements and orchestration can turn the most hackneyed pop number into a pleasant piece. Sound quality on this disc is not up to the highest standards achieved by EMI, strings are a little "edgy" on some tracks. But as far as most people are concerned this would be nitpicking. Stereo spread is wide and even. A good buy.

There are 12 tracks: Friends — She's A Lady — My Sweet Lord — Adagio Pour Un Venitien Anonyme — Je T'Appartiens — Mourir D' Aimer — Wild World — Adelaide — Sad Lisa — Un Banc, Un Arbre, Une Rue — Je Pense A Toi — Comme Moi (Close To You). (L.D.S.)

★ ★ ★

GOLDEN STRINGS — Vol. 2. Hans Richter and his Orchestra. Stereo, Columbia SOEX 9890, series 275.

Although there is no direct information on the sleeve to confirm it, this is undoubtedly one of the series of Toshiba records distributed here by EMI. The recording is

very clean but the bass frequencies are very prominent, and although many people seem to prefer this, if you are like me you will be wanting to set your bass boost control futher back than your normal setting. The program is very pleasant but unexceptional, comprising a selection of popular melodies played a la Mantovani, with emphasis on the strings: Londonderry Air — Home Sweet Home — Home on the Range — Lorelei — Molly Darling — Annie Laurie — Greensleeves — Terang Boelan — Dreaming of Home and Mother — Danube Waves Waltz — Swannee River — Auld Lang Syne. If the selection appeals, you can rate this excellent value at $2.75. (H.A.T.)

★ ★ ★

SUPER PARTY. Jo Ment's Happy Sound and the Jo Ment Singers. Stereo Interfusion SITFL-183/4. Two record set $7.95.

Jo Ment will probably be a new name to many record buyers but he was well known back in the "big band" era. Don't let that put you off — he doesn't sound old. He has taken a good selection of numbers that are popular at any party and given them arrangements that are, for the most part, lively enough for todays listeners. He even adds a party atmosphere with people laughing and "carrying on" in the background.

Recording quality is fine throughout both discs and surface noise is negligible. Some of the selections are as follows: Let The Sun Shine In — Na Na Hey Hey Kiss Him Goodbye — Yellow Submarine — Bend It — La Bamba — Zorba's Dance — When The Saints Go marching In — America — La Bostella. (L.D.S.)

★ ★ ★

MANUEL MEETS PEPE JARAMILLO. Pepe Jaramillo, piano, with Manuel and his Music of the Mountains. Studio 2 Stereo (EMI) TWO 359.

In my experience, most people who enjoy the music of Pepe Jaramillo also find pleasure in the offerings of Manuel and the Music of the Mountains, and vice versa. Well, here they are together, for the first time on disc, and no doubt this "double billing" will attract many purchasers. I can't say I found the result anything to get excited about — the whole thing sounded just a bit too bland. So it might be wise not to buy without first hearing a track or two, to decide whether you like like this combination. The sound quality is of good modern standard, and the track titles are: High Noon — Maybe — Papaya — To Be the One You Love — Look Around — Madrid — Cumana — Canadian Sunset — Johnny Guitar — Santa Gallura — Soledad — Up, Up and Away. (H.A.T.)

★ ★ ★

TIJUANA TIME. LOS ALAMOS. Axis stereo 6018.

If you lack a record of music played in the style of Herb Alpert's "Tijuana Brass", then this album priced at $2.50 makes excellent buying. Recording quality and stereo spread are very good. Surface noise is negligible.

Twelve tracks are featured: Tijuana Taxi

— The Green Leaves of Summer — The Look Of Love — Somethin' Stupid — Tijuana Time — Sunny — Greensleeves — Can't Take My My Eyes Off Of You — Braziliana — Miss Otis Regrets & The Lonely Ones — Goin' Out Of My Head. (L.D.S.)

★ ★ ★

NANCY & LEE AGAIN. Nancy Sinatra and Lee Hazelwood. RCA Victor stereo LSP-4645.

Fans of this very successful duo will be interested in their latest album. It contains their current hit "Did You Ever". Stereo spread and recording quality are fine. Surface noise is negligible.

Other tracks are: Arkansas Coal — Big Red Balloon — Friendship Train — Paris Summer — Congratulations — Down from Dover — Tippy Toes — Back On The Road — Got It Together. (L.D.S.)

★ ★ ★

FOR ALL WE KNOW. Andre Kostelanetz and his orchestra. CBS stereo SBP 233994.

As the sleeve notes point out, Andre Kostelanetz plays to a devoted audience that is very large, but his appeal is hard to define. To me, his music is undistinguished. As far as this performer is concerned, I am clearly out of step with a large number of people. If they liked his previous albums, then this is of much the same standard.

Recording quality is good and the stereo spread normal. There are eleven tracks: For All We Know — Put Your Hand In The Hand — I Don't Know How To Love Him — If — Pieces of Dreams — Lolita — Bridge Over Troubled Water — Someone Who Cares — I Think Of You — Love's Lines, Angles and Rhymes — Losing My Mind. (L.D.S.)

★ ★ ★

WHAT A WONDERFUL WORLD! The Mills Brothers. Paramount stereo SPML-934490.

In an age when harmony seems to be almost forgotten, the Mills Brothers are still very popular, albeit with the older generation. To my ear though, they are not as smooth as of old but I suppose this can be expected from a trio approaching their sixties. Still, the album will have great appeal to those who have always been fans.

Recording quality is okay. Eleven songs are presented: Come Summer — Sally Sunshine — What A Wonderful World — Everybody But Me — The Drum — My Sweet Mama — Lazybones — Angels Never Leave Heaven — Strollin' — Someday You'll Be Sorry — Happy Songs Of Love. (L.D.S.)

★ ★ ★

LAI, BACHARACH AND SIMON. Coast Symphonic Orchestra. Columbia stereo SOEX 9885.

The Coast Symphonic Orchestra appears to be the same as that featured in "Golden Easy Listening", another record in the Columbia Series 275 which was reviewed in these columns several months ago. As with that record, this album is fine as a background for dining or relaxation. Recording quality is good and the price is right at $2.95.

Twelve popular tunes are featured: Love Story — Mexican Divorce — Bridge Over Troubled Water — 13 Jours En France — Sounds Of Silence — Raindrops Keep Fallin' On My Head — Les Hommes . . . C'est Tous Les Memes — April Fools — Scarborough Fair — Vivre Pour Vivre — Do You Know The Way To San Jose — Mrs Robinson (L.D.S.)

★ ★ ★

ORGAN HITS OF THE 70s. Tony Fenelon, organ and piano. Brian Czempinski drums. Stereo, Festival SFL-934476.

After a series of albums done in theatre style on a theatre-voiced organ, this one is quite a change. By multiple recording techniques Tony Fenelon turns himself into two or three different artists playing a Thomas Palace III organ, a Baldwin organ and a Yamaha grand piano. The rhythms range from rock, through latin to gentle swing, with plenty to catch the ear of those interested in technique. It also makes pretty good listening for those not technically inclined: Taste Of Honey — Love Is Blue — Jean — Sunny — My Way — Like An Eagle — Midnight Cowboy — Brazilian Sleigh Bells — Meditation — Serenade To Summertime — Born Free — Himara Festival.

Technically, the sound is excellent and, if you'd like to hear Tony Fenelon in a different role, the album can be bought with confidence. (W.N.W.)

★ ★ ★

MUSIC OF THE INCAS. Pachamac. Stereo, His Master's Voice Worldwide Series, SOXLP 7543.

The sleeve note tells us that Pachamac are "a septet of musicians dedicated to the presentation and preservation of the Incan musical traditions in Europe". They play traditional Incan instruments dating both from before and after the Spanish conquest, but it should be noted that the music is all from the post-Conquistador period, and therefore is greatly Spanish influenced. In many cases, there is a distinct resemblance to modern Latin American music. An interesting disc, which will appeal particularly to those with a taste for ethnic music, but I feel its appeal is rather wider than this. After one hearing, my wife firmly confiscated it for her personal collection. The recording is bright and clean, and with no noticeable distortion. (H.A.T.)

★ ★ ★

FLAMENCO PURO "LIVE". Paco Pena and his group. Stereo Decca Phase Four PFS 4237.

This is rather more earnest flamenco than much of the prettied-up material often presented in recorded performances. Most of the tracks have a cantor singing in the typical dark-hued, gravelly voice, and there is plenty of taconeo and zapateado, with the performers being urged on by enthusiastic interjection from the bystanders. In fact, the whole thing is intended to create the atmosphere of the jaleo, in which those present are expected to come to the centre and do their thing spontaneously, to the rhythmic hand clapping and vocal support of the others.

The recording well maintains the excellent reputation of Phase Four, and the lifelike sound and stereo spread can make you believe you are really in the middle of the event if you close your eyes. (H.A.T.)

★ ★ ★

HAPPY AND IN LOVE. The Shirelles. RCA Victor stereo LSP-4581.

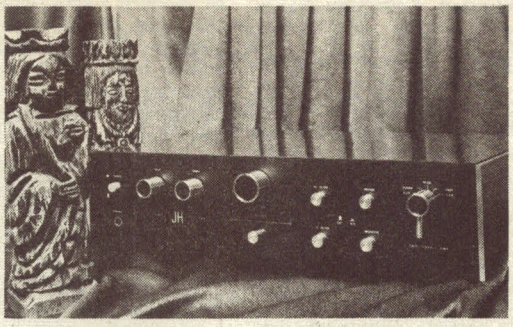
Apparently, the Shirelles were a successful pop group at some time in the past but the cover notes on this record give no clues as to when. The Shirelles are three coloured girls with a singing style not unlike the Supremes and their standard is at least equal, if not better, to that of the latter well-known group. The album is not a re-issue but was recorded in 1971. As expected, sound quality is above reproach.

Eleven songs are featured, two in the form of a medley: No Sugar Tonight — Boy You're Too Young — Go Away And Find Yourself — There's Nothing In This World — I've Never Found A Boy — Take Me — Dedicated To The One I Love — It's Gonna Take A Miracle — We Got A Lot Of Lovin' To Do — Strange, I Still Love You. (L.D.S.).

JH STEREO AMPLIFIER

A "State of the Art" Design

Distributed in Australia, NZ, USA and Canada



Actual power — 50 watts rms (8 ohms)

CHOOSING THE BEST

There is a line in a song – "How does the wine taste – is it good?" A group of connoisseurs can quickly answer this question and they will usually be in agreement.

The choice of an audio amplifier is not quite so simple. The buyer is faced with a glittering array of well packaged products and whatever he selects will only be as satisfying as its performance in his own home in combination with other equipment. It may be days or weeks before he knows whether he has purchased wisely or spent his moeny on an unnecessary collection of knobs in a glamorous case.

A FACT TO BE FACED

The real truth is to be found in the fundamental fact that good amplifiers are just as rare as good designers and these are rare indeed. Those designers usually have a long queue waiting for custom built amplifiers.

Imagine the difficulty in finding this combination of talents:–

- An electronics graduate with specialized audio engineering background.
- A music lover who regularly attends live concerts.
- Such an individual who has spent a lifetime dedicated to the ideal of translating the sum of science and art in the attempt to approach perfection in the electronic reproduction of the live orchestral sounds.

The buyer who realizes just what a problem it is to find such a designer will understand why there are so few audio amplifiers which the real dedicated audiophile would care to buy. The "J.H." amplifier is such a gem that it would be worthwhile standing in a queue, if that were necessary.

BUY "JH" CONFIDENTLY

The technical specifications relating to the JH stereo amplifier are excellent and the performance vastly in excess of any other instrument in the same price bracket. It will provide fatigue free satisfying sound because it has been designed by a connoisseur (who did have a very long queue).

SPECIFICATIONS		
Power output (total)	Claimed:	40 watts rms into 8 ohms
	Actual:	50 watts rms into 8 ohms
		30 watts rms into 15 ohms
BANDWIDTH	Above power holds good from 25 – 30000 Hz.	
FREQUENCY RESPONSE	10 – 50000 Hz. – 3dB.	
	20 – 40000 Hz. ±.25dB.	
DISTORTION	Amp. only	.04% at full power (1000 Hz)
	Overall	better than .15%
	Intermod.	better than .2%
SIGNAL/NOISE RATIO		58dB. on phono (better on other inputs)
SENSITIVITY	Phono	3 m.v.
	Other	200 m.v.
TONE CONTROL	Bass	±10dB. at 100 Hz.
	Treble	±10dB. at 10000 Hz.
DAMPING FACTORS		8 ohms = 40 15 ohms = 70
POWER CONSUMPTION		45 watts.

Interstate Distributors:–

NSW: Electronic Parts Pty Ltd, 91a York St, Sydney.
SA: The Muses Pty Ltd (Sound Spectrum), 33 Regent Arcade, Adelaide.
Qld: Brisbane Agencies, 72 Wickham St, Valley, Brisbane.
WA: Arena Distributors (Australia) Pty Ltd, 196 Adelaide Tce, Perth.
Victoria, Tasmania & NT: J. H. Reproducers Co.

National Distributors:

J. H. REPRODUCERS CO,

293 HUNTINGDALE RD, CHADSTONE, VIC. 3148.
TELEPHONES: 277-3066, 277-3488.

(Manufacturers of the famous "JH" Turntable)

MUSIC HALL PARTY. Mrs Mills. Stereo EMI Parlophone PCSO-7143.

Long years of playing for "hops" has given Mrs Mills a strong set of fingers, an impeccable tempo and an easy familiarity with the old tunes that seemed to characterise wartime London. The twenty distinct tracks make the album rather "bitty" but, among the bits, you get "Lily of Laguna", "Tipperary", "The Band Played On", "Burlington Bertie" and a string of others of similar vintage. Adding to the atmosphere is a percussionist and banjo player.

If you enjoyed the old-time dances, there's a fair chance that you'll enjoy this album (W.N.W.)

★ ★ ★

STRANGE SHADOWS. Francoise Hardy. Stereo, Interfusion (Festival) two record set SITFL-161 / 2.

LA QUESTION. Francoise Hardy. Stereo, Interfusion SITFL-934441.

Francoise Hardy fans, who may have had cause to feel neglected of late, now have the choice of a two disc set at budget price ($7.95) or a single album at full price. No information is given about any of the tracks, but to judge by the style, the two disc set may contain reissues, while the other disc is almost certainly a completely new recording.

The double set has M'selle Hardy singing in the wistful, questioning style which characterised her earlier discs. In the single disc, she has the assurance of the mature woman, and the only question, implied by the disc title, is "What went wrong?" All songs are sung in French, and with 24 titles in the double set, and 12 in the single disc, there is not space to list them. In any case, I doubt whether the titles will assist, but I can assure intending purchasers that they are unlikely to duplicate anything they may have in earlier Hardy discs. I believe I have had them all, and none of these titles is to be found in them. I could not find anything to complain about in the technical quality of either release. (H.A.T.)

★ ★ ★

RH POSITIVE. Rolf Harris. Stereo Axis (EMI) 6022.

It's pretty certain that you've heard the tracks on this album any number of times but Rolf Harris is one of those people who never seem to wear out their welcome. Here are the tracks: The Court Of King Caractacus — Wild Colonial Boy — Carra Barra Wirra Canna — I'll Be Hanged — Hurry Home — London Town — Botany Boy — Moon River — Let The Rest Of The World Go By — The Road To Gundagai — Sun Arise — If I Were A Rich Man.

If you don't already have a Rolf Harris album in your collection, this budget-priced release is a must. (W.N.W.)

★ ★ ★

SOMETHING SPECIAL. Connie Eaton. Stereo Interfusion (Festival) SITFL-934406.

Whether or not Connie Eaton has had previous records I do not know, but this record certainly indicates that she should be better known. As a C&W artist she has very good vocal range and her voice does not have that overemphasised "nasal twang", characteristic of so many C&W singers. Consequently, she will appeal to a far wider audience than just C&W fans.

Quality of the recording is excellent and the stereo spread is wide. There are twelve tracks: Angel of the Morning — Leave Me — Sing A Happy Song — Stand By Your Man — One Time Too Many — Glad to Be Your Woman — Tar And Cement — Memories — Get Together — Take Me Back — Games People Play — Tomorrow My Baby's Coming Home. (L.D.S.)

★ ★ ★

GREATEST HITS. Anthony Armstrong Jones. Stereo, Interfusion, SITFL-934405.

Ever heard of a C&W singer connected with royalty? Well apparently this connection has been contrived. Worse gimmicks have been used. As a singer he may do well if he avoids "bluesy" numbers — his breath and pitch control leaves much to be desired. Musical arrangements on the disc are on the pedestrian side but recording quality is good.

If you're still interested, there are 12 tracks: Take A Letter Maria — Sugar In The Flowers — New Orleans — Make It Hard For Me — I Forgot To Live Today — Lead Me Not Into Temptation — That Lucky Old Sun — Proud Mary — And Say Goodbye — Sweet Caroline — I'm Gonna Stop Loving You — Too Much Of You. (L.D.S.)

Also received . . .

The following records have not been played all through, but have been sampled to assess technical quality. Unless otherwise stated, the discs may be assumed to be technically satisfactory.

ROCKIN'. The Guess Who. Stereo, RCA Victor LSP-4602. Contents: Heartbroken Bopper — Get Your Ribbons On — Smoke Big Factory — Arriverderci Girl — Guns Guns Guns — Running Bear — Back to the City — Your Nashville Sneakers — Herbert's a Loser — Hi Rockers!

ELVIS NOW. Elvis Presley. Stereo, RCA Victor LSP-4671. Ten Tracks: Help Me Make It Though the Night — Miracle of the Rosary — Hey Jude — Put Your Hand in the Hand — Until It's Time For You to Go — We Can Make the Morning — Early Mornin' Rain — Sylvia — Fools Rush In — I Was Born Ten Thousand Years Ago.

TWO LITTLE BOYS. Rolf Harris. Stereo, Interfusion (Festival) SITFL-934200. Incorporates the previous best-selling single with the following additional tracks: Love My Love — Come Off It Old Blue — The Lambton Worm — Click Song — We're the Maoris — Early Morning Rain — I In My Chair — Tenderness in You — Good Ship Venus — Footsteps in the Fog — Moscow's in Love.

FERRANTE AND TEICHER PLAY MUSIC FROM FIDDLER ON THE ROOF. Stereo, United Artists (Festival) SUAL 934364.

IT'S TOO LATE. Ferrante and Teicher. Stereo, United Artists (Festival) SUAL 934360. Title track plus 11 others: You've Got a Friend — Put Your Hand in the Hand — Rainy Days and Mondays — Theme from Love Story — Gitchie Goomie — Proud Mary — For All We Know — Mozart No 40 — It's Impossible — Applause — Once Around the World.

SUPERSTAR GUITAR. Tony Mottola. Stereo, Project 3 (Festival) SPJL 936494. Has 12 tracks, including: Superstar — Windy — Volare — Love — Spanish Harlem — Spinning Wheel — Wichita Linesman.

WHERE'S POPPA? Original motion picture score. Stereo, United Artists (Festival) SUAL-934109.

LOVE STORY and other movie themes for 1971. Various artists and orchestras. Stereo, Calendar (Festival) SR66-9818. Has 14 tracks, with themes from Love Story — Patton — Midnight Cowboy — "Z" — Alfie — A Man and Woman — The Good, the Bad and the Ugly. From other films: Raindrops Keep Fallin' — Windmills of Your Mind — A Time for Us — Mah-Na-Mah-Na — Hushabye Mountain.

GERMAN (DIN) HI-FI

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Jazz and Rock . . .

DALY-WILSON BIG BAND. Featuring Kerrie Biddell. Festival stereo SFL-934453.

This is another good recording job from Spencer Lee at United Sound, Sydney. The big band formed by Warren Daly and Ed Wilson is one of the few bands of its type in the world playing big band jazz and swing. The band has loosened up amazingly in the few years of its existence and on this LP it has the friendliness of the Count Basie band.

Kerrie Biddell sings on four of the tracks. She has a good style, both uptempo and slow ballad.

Most of the compositions on the LP are local. "City Sounds" features Kerrie and winds up with an interesting trumpet / drum duet. "Col's Dilemma" features thoughtful organ playing by Col Nolan. "Do Me a Good Turn", written by Bryce Rohde, is a rousing foot stomper. There are very few spots in the performance which aren't written out. The band swings mightily and loudly. This is wonderful young man's jazz / rock. (G.W.)

★ ★ ★

200 MOTELS. Frank Zappa and the Mothers of Invention. United Artists stereo SUAL-934326 / 2.

The Mothers had the Royal Philharmonic Orchestra along on this date, which almost seems worth mentioning. Some of the tunes are from the soundtrack of a movie written by Zappa. Zappa wrote the songs, too, in motel bedrooms, hence the title of the album and film. Anybody who spent several years staying at motels should be forgiven for having a disenchanted view of life.

Zappa gets even with songs "I'm Stealing the Towels", "The Sealed Tuna Bolero" and "Dew on the Newts We Got".

The sounds are violent, so are the situations portrayed by Zappa.

Zappa is the leading rock music satirist. He takes a cliche and turns it into something grotesque. He usually manages to swing as he plays his way through this musical Lilliput. (G.W.)

★ ★ ★

CHICAGO. CBS Records stereo S4PB 220501.

There are four LPs of music in this handsome boxed set. You also get a book of pictures and a wall poster of Carnegie Hall, New York, where the music was recorded. Paste the picture on the wall, load up the deck, turn up the volume and whee! Instant Carnegie Hall. One problem is the lack of automatic coupling on the discs — an annoying feature of far too many multiple sets these days.

Chicago are one of the few groups to make a success of combining the instrumentation of jazz with the immediacy of rock and roll.

The seven-piece instrumentation — reeds, trumpet, trombone, guitar, bass, piano and drums — looks like a traditional New Orleans line-up. The difference is in the promotion of the guitar to a lead instrument and the relegation of the reeds to colour work most of the time. There is also more singing than you would ever get from a jazz group.

Chicago play their own things most of the time. Robert Lamm, the pianist, Terry Kath, the guitarist, composed most of them. A five-part version of "It Better End Soon" is the most ambitious performance. It fills a whole LP side.

The LPs were made during a concert season. Chicago were playing to a live audience. Although most of the numbers have been performed before at studio sessions, the live audience encouraged inspired improvisations from the group.

Some of the best tracks are "Mother", "Colour My World", "Flight 602" and "Does Anybody Really Know What Time it is?" (G.W.)

★ ★ ★

DEAD FOREVER. Buffalo. Vertigo stereo 6357 007.

The Phonogram people got quite carried away when they recorded this group at United Sound, Sydney and persuaded the Vertigo (London) people to allow them to release it on their label, noted for heavy rock. The instruction on the label says that the record should be played loud. If you have the taste for that sort of thing, go ahead. The disc has been balanced so that the two lead singers Dave Tice and Alan Milano, have a value equal to Paul Balbi's drums, equal to Peter Wells' bass, equal to John Baxter's guitar. Thus it needs volume (or stereophones) to bring the individual lines up to a sound level at which they can be sorted.

It's a musical approach which sounds dull to start with but gains from repetition. The music is basically for dancing.

Most of the tunes are originals, they are blues-oriented ditties about gentlemen whose women "done gone 'way." "Suzy Sunshine" which Buffalo used for an assault on the charts, sounds on the muddy side. "Pay My Dues" has a clever sound effects opening. "I'm a Mover" builds in intensity and gets the party moving. "The Ballad of Irving Fink" features a dominating figure played on the bass. Spencer Lee was the recording engineer. (G.W.)

★ ★ ★

SIXTEEN DIXIELAND GREATS. Bob Barnard's All-Star Jazz Group. Axis stereo 6014.

Barnard is one of the world's great jazz trumpets and you can hear him on this superb selection on the low-priced Axis label. The session was recorded at the EMI studios in Sydney. Members of the group were Bob Barnard on trumpet, Norm Wyatt (trombone), Claire Bail (clarinet), Bill Benham (piano), Ron Carson (banjo), Ed Gaston (bass) and Laurie Thompson (drums).

The repertoire is made up of the old favourites, "Muskrat Ramble", "St. Louis Blues", "Basin Street" even "The Saints".

Bob's improvisation is impeccable. Claire Bail on clarinet lends a Benny Goodman jam session sound to the occasion. (G.W.)

★ ★ ★

SATURDAY MORNING MOVIES. Stray. Transatlantic stereo STAL-934447.

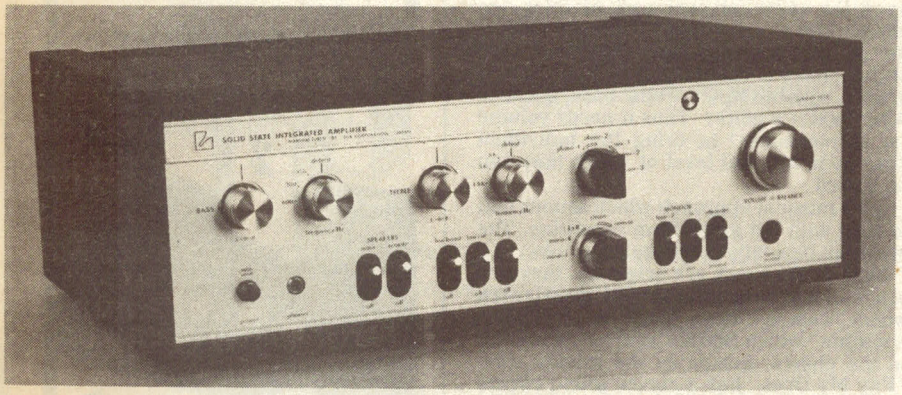
The theory behind this album seems to be that as there are no Saturday morning movies to help you forget childhood realities you might as well listen to the hard rock of Stray.

It doesn't follow that rock music is as interesting a fantasy world as those old MGM movies with hundreds in the chorus line. Just to remind you there's an old movie still on the cover. Stray play and sing about the world of unemployment and crashed hopes for the young. "Queen of the Sea" and "Our Song" are samples. (G.W.)

PRODUCT REVIEWS AND RELEASES

LUXMAN SQ 505X — "reproduction is excellent"

Latest addition to range delivers 30 watts per channel at less than 0.04% distortion. The main amplifier employs integrated circuits, and the speakers are direct coupled to improve damping factor and power bandwidth at lower frequencies.



The Luxman SQ505X Integrated Stereo Amplifier has a modern appearance. The overall dimensions are 6-5/16(h) x 17¾(w) x 10-9/16(d) inches (160mm x 450mm x 268mm). The cabinet is walnut veneered plywood, while the front panel has a satin chrome finish.

Facilities on the front panel include a DIN socket for input and output of a second tape recorder, along with a toggle switch to allow selection of Tape 1 or Tape 2. There is also a toggle switch labelled "attenuate" to temporarily lower the output level while a telephone is being answered, etc.

Main or remote speakers can be switched via two more toggle switches. There are also toggle switches for bass cut, treble cut and bass boost. A stereo phone jack is provided.

As well as the normal bass and treble controls, there are two rotary switches to vary the bass and treble control roll off frequencies. With both of these controls switched to "defeat" the response of the amplifier is flat and the tone controls have no effect.

At the back of the unit there is a switch to allow selection of 30k, 50k or 100k input impedance to phono 1. Phono 2 input impedance is set at 50k. There are 22 phono type sockets at the back for the various input and output requirements.

In our tests of the unit we were able to verify the manufacturers specifications in all respects. Power output was 30 watts RMS per channel, with both channels driven, for 0.04% distortion. At onset of clipping we recorded 50 watts per channel. In both cases this was across 8-ohm loads. The power bandwidth (0.04%, -3dB) is 5Hz to 50kHz. Frequency response was verified as being 10Hz to 50kHz at less than -1dB. Signal to noise ratio via the auxiliary input was better than 80dB, while via the phono input we recorded 60dB.

Tone control range varied with the roll off setting mentioned earlier. Treble range at 10kHz with the roll off set at 6kHz was +12dB -12dB, while the bass range at 100Hz with roll off at 600Hz was also +12dB-12dB. The attenuate switch dropped all frequencies 20dB. The treble cut filter begins to act at 6kHz and has a -6dB per octave slope. Likewise the bass cut has a -6dB slope below 70Hz. Channel separation was measured at 100Hz, 1kHz and 10kHz, with the results being 60dB, 60dB and 50dB respectively Residual noise was less than 1mV.

The removal of four screws on the underside of the unit allows one to slide the cabinet away. The layout is good, there is ample space and all boards are well secured. The output transistors are mounted on T shaped heatsinks, the "top" of the T being exposed to ambient at the back of the unit. The main amp boards are situated directly behind the output transistors on the opposite side of each heatsink. Part of the cabinet is cut away directly above these heatsinks and a black grille inserted to allow ample ventilation. There is also ventilation under the heatsinks to allow airflow.

A listening test, using familiar speakers and source material, proved what a superb unit this is. The user has complete control, and reproduction is excellent. For $366 (suggested retail price) one would expect this unit to be better than average, and it certainly is.

The Luxman SQ505X is distributed in Australia by International Dynamics (Agencies) Pty Ltd, 23 Elma Road, North Cheltenham, 3192. Correspondence to PO Box No 205 Cheltenham (G.N.).

Sydney wholesaler enters components retail field

JOHN CARR & CO PTY LTD, who have been widely known for over 40 years as wholesalers of electrical insulation materials, has expanded its activities by entering the electronics components field. The company will operate at all levels and its activities will include importing, manufacturing, wholesaling, and retailing. Retailing will be carried out from a new self-service showroom and by mail order. The company premises are situated at 405 Sussex Street, Sydney, and the entrance to the showroom is from a courtyard off Little Hay Street. The postal address is PO Box 39, Haymarket, Sydney, NSW 2000, and the telephone number is 211 5077.

General manager Mr V. L. Stanton has advised that his company has been aware for some time that many items previously supplied by them to large manufacturers are also of interest to the smaller user, and particularly the home constructor. These items include transformers, bobbins, lacing cords, dial drive drums, pulleys, springs and cords, as well as the company's comprehensive range of electrical insulating sleeving, tapes, clothes and papers.

Kenwood cassette deck with Dolby noise reduction

New high performance cassette deck features Dolby type-B circuitry, also bias switching to suit regular, low noise and chromium dioxide tape.

The Kenwood KX-700 stereo cassette deck is aesthetically appealing. Overall dimensions are 15½(w) x 4⅝(h) x 11⅜(d) inches. A teak veneered surround is complemented by formed plastic top and bottom panels. The control panel is satin chrome finished with black lettering.

There are seven piano key controls situated in a well directly in front of the cassette well. These controls are interlocked. Four slide pots allow record and playback levels to be adjusted.

The cassette well lid has a tinted acrylic window. Adjacent to the cassette well are the three bias select pushbuttons, with two toggle switches for Dolby on-off and power to the right of these.

The two VU meters are situated under a masked and tinted acrylic insert. Windows in this insert also reveal orange Dolby and Record indicator lights, and a three digit resettable counter. The insert is inclined toward the user to allow the VU meters to be viewed easily. The meters are calibrated -20 to +3VU and they are well lit. Points on the scale labeled "DL" indicate the recording level for optimum results when Dolby is used.

A stereo phone jack is provided. There are large jacks for left and right channel microphones. Four phono sockets are provided at the back of the unit for line input and output.

We checked the manufacturer's specifications using regular and chromium tape, and with and without Dolby. The manufacturer does not quote references for these measurements so we assumed the generally accepted levels and extremes.

Overall record-play frequency response was measured with the record input level at -20VU. For chromium tape we verified the claimed response from 25Hz to 16kHz (±3dB), however with regular tape the results were not nearly as good. This may have been due to misadjustment of the factory-set record bias level for regular tape.

Signal to noise was measured for a 1kHz sinewave input and recording level OVU. Off chromium tape our figure was 48dB with Dolby off and 50dB with Dolby. The manufacturer qotes 58dB with Dolby, but we detected some residual hum and noise even when the unit was played without tape, and it would appear that this was responsible for the poorer figures. Signal to noise ratio off regular tape was 46dB without Dolby and again 50dB with Dolby on.

Distortion was verified as less than 2%. Separation between tracks was measured for 100Hz, 1kHz and 10kHz at 42dB, 42dB and 40dB respectively. The recording level for both of these tests was OVU.

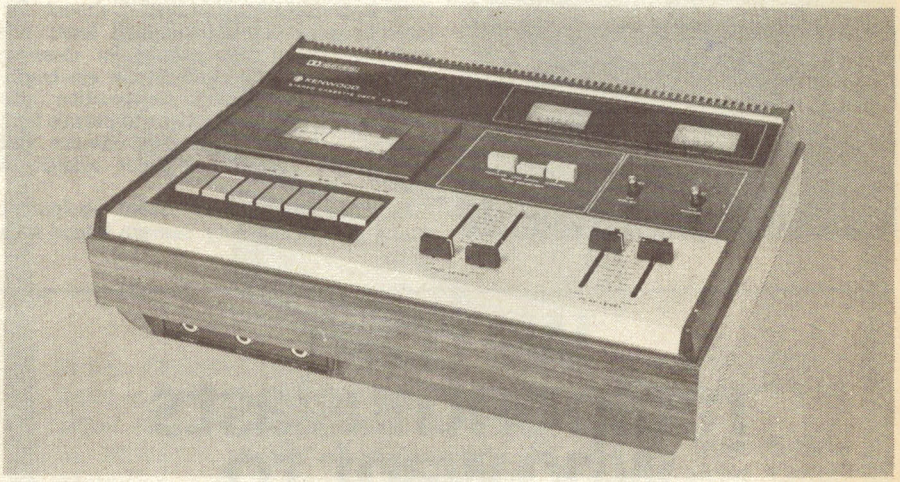
The tape transport seems to be very reliable. As mentioned earlier the controls are interlocked in the usual manner. The fast forward and rewind modes can be switched as quickly as one is capable without any sign of tape lag or jerk. There are auto stop facilities included. If the tape jams or reaches the end, the unit will switch off approximately five seconds later, regardless of mode. The resettable counter is extremely accurate, enabling us to play back tracks in exact synchronism with the disc from which they were recorded.

The interior of the unit is well laid out and all wiring is tied down. There are three printed wiring boards. The motor is situated well away from the boards in the back left-hand corner. There is a cooling fan on the motor, and ventilation slots in the plastic bottom panel.

Using the unit in conjunction with a high quality solid state amplifier, we dubbed some music tracks off some familiar discs and compared them on playback with the originals. With the Dolby circuitry disabled, the reproduction was very close to the original, although as one would expect the hiss level was noticeable on quiet passages. When the Dolby facility was used the audible noise level was reduced very markedly, and it became virtually impossible to pick the dubbing from the original. The residual noise and hum did not seem to be as noticeable as the instrument tests had led us to expect.

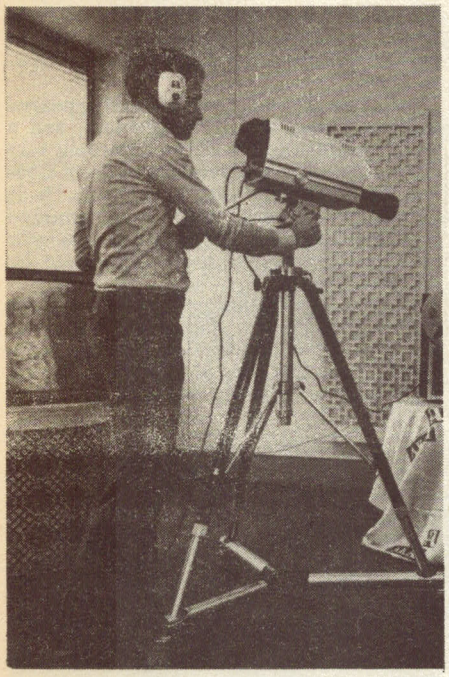
Although the sample unit tested appeared to have a hum and noise problem, and a slight misadjustment of the recording bias for normal tape, our reaction to the KX-700 was on the whole very favourable. It is certainly a very high performance machine, and the Dolby-B circuitry is very effective in reducing noise introduced by the tape itself.

The suggested retail price for the KX-700 is $299.00. Enquiries should be directed to the Australian distributors for Kenwood, Jacoby Mitchell Ltd, of 215 North Rocks Road, North Rocks, NSW. (G.N.)



Low-cost closed-circuit television camera

A closed-circuit TV camera with built-in viewfinder is available for less than $1000 with standard accessories from Magnecord Sales and Service.



Manufactured in Japan, the Concord NEI-17 CCTV camera is designed and engineered to meet highest quality standards for total performance. Rugged construction and all solid-state electronics with silicon transistors ensure reliable, maintenance-free use for heavy duty applications in business, education and industry. The high-resolution camera provides its own sync, and is suitable for single camera use or multiple camera operation.

Other performance features of the NEI-17 include: built-in selector switch for electronic or manual light compensation to maintain consistent recording quality; high resolution for excellent picture contrast and definition; highly sensitive model 7262A vidicon tube for long life and continuous-duty applications; standard C-mount for interchangeability of standard lens; adjustable vidicon tube control for close-up focusing within 1in; in-built 5in electronic viewfinder for correct composition and definition; high signal output to permit long distance connection between camera and video tape recorder without additional amplification.

Included in the basic $1000 equipment would be a heavy-duty Samson tripod with elevator and dolly, a zoom lens 22.5 to 90mm f / 1.5 and either a wide-angle lens 12.5mm f / 1.4 or a telephoto lens 150mm f / 3.2. The tripod has two-section legs, 1½in and 1.in diameter, and a 1¾in diameter elevator with an 18in rise. The dolly has hinge pins to anchor the tripod legs in recesses in the dolly arms. The prices (without tax) of the individual items are: camera with viewfinder, $424.60; tripod, $163.90; dolly, $60.50; zoom lens, $264.00; wide-angle lens, $70.40; telephoto lens, $71.80.

Other Concord CCTV accessories available include two motorised pan / tilt units with remote control ($506 and $748), a motorised pan / tilt / zoom unit ($1078), and a remote controlled zoom lens 22.5 to 90mm f / 1.5 ($748).

Full information about the Concord range of closed circuit television equipment, including the NEI-17 camera, can be obtained from Magnecord Sales and Service, 276 Castlereagh Street, Sydney, 2000. (J.H.)

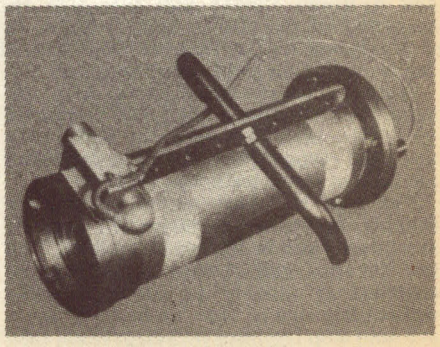
Underwater television system from Japan

An advanced diver-held under-sea television system, manufactured in Japan by Ikegami Tsushinki Co Ltd, is now available in Australia through Australian Video Engineering.

The ITC model DV-200 underwater TV camera system is designed to be used for underwater surveillance at depths down to 200m. The camera head is in a water-tight carrying case, and comes complete with vidicon, illumination lamp, and a 50m long 25-core cable with waterproof connectors.

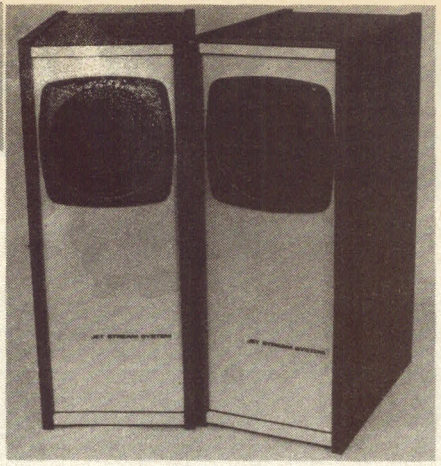
The totally waterproofed deck control unit includes a 9in picture monitor. It has a water leakage alarm and remote camera controls for beam, focus, target and iris. Several remote monitors can be attached so that individual group observation is possible for educational or conference use. Video signals from the underwater camera can be recorded and replayed using a video tape recorder which is available as an optional extra.

Detailed specifications and the price of the DV-200 may be obtained from Australian Video Engineering, 7 The Crescent, Annandale, NSW 2038.



Camera head of the DV-200 system

AKAI "JET STREAM" LOUDSPEAKER SYSTEM



The Akai SW-35 speaker enclosure has a modern appearance. The front of the enclosure is finished with anodised aluminium sheet, with a plastic insert surrounding the speaker opening. The actual enclosure is made from walnut veneered plywood. The overall dimensions are 6.8 (w) x 17.2 (h) x 10.8 (d) inches, (170 x 430 x 270 mm). The speaker has a 5¼ inch flange diameter, and a voice coil impedance at 400Hz of 8 ohms. The term "Jet Stream" relates to the fact that the enclosure is a labyrinth type utilising a relatively long path from back to front to reinforce the bass response.

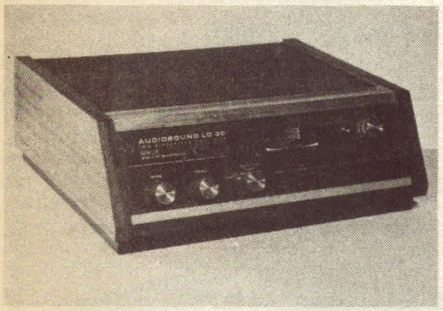
Akai quote frequency response as 40Hz to 18kHz with no references, and maximum power input as 15 watts (music power). The resonant frequency of the sample enclosures reviewed occurred at approximately 80Hz. From 80Hz to 8kHz the response remained relatively flat, while above 8kHz it began to drop. Below 40Hz we detected slight flutter of the high frequency cone at medium volume levels. We compared the speakers with another familiar pair of equivalent size, using music program material. The Akai enclosures had a notable prominence in the middle of the spectrum, and less output at the upper treble register. Acoustic efficiency of the Akai systems was quite good, however.

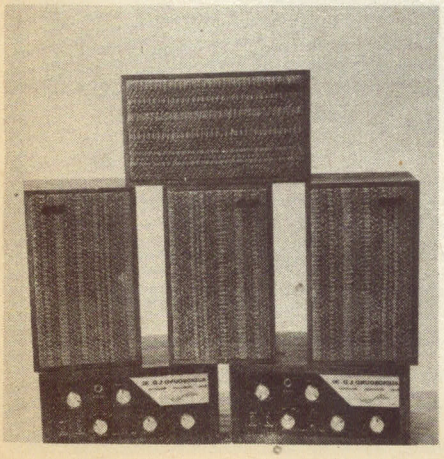
Nevertheless when used with amplifiers incorporating bass and treble boost, these enclosures would be capable of very pleasant reproduction, and their efficiency would make them quite suitable for modest power applications such as smaller power amplifiers and most tape recorders.

Akai SW-35 speaker enclosures are available ex stock in Australia and are distributed by Akai Australia Pty Ltd, 276 Castlereagh Street, Sydney, NSW, 2000. (G.N.)

New styling for Audiosound amplifiers

Audiosound Electronic Services has announced a new look series of the LD 30 amplifiers, designated MkII, and replacing previous models in this range.





Whilst the most significant change is in appearance, (see top photograph), the new models have an 18dB / octave low-pass Butterworth filter to remove excessive scratch and noise from tapes and records. Other features (such as direct coupling, no electrolytic capacitors in signal circuits, low peak distortion, etc) have been retained together with plug-in module construction for rapid servicing. The price of the new LD 30 Mk II is $286 (inc sales tax) compared with $255 for the earlier models.

The lower photograph shows two LD 30 amplifiers and four Motet-S loudspeaker systems which were recently designed and supplied by Audiosound to the School of Architecture, Institute of Technology, Sydney. The Motet-S system was designed to give extreme portability for on-site testing and acoustic measurements in small environments. The free field response curve is ±6dB from 45 to 20,000Hz. As this system was intended specifically for this application, it is not intended to release this model for general sale in its present form.

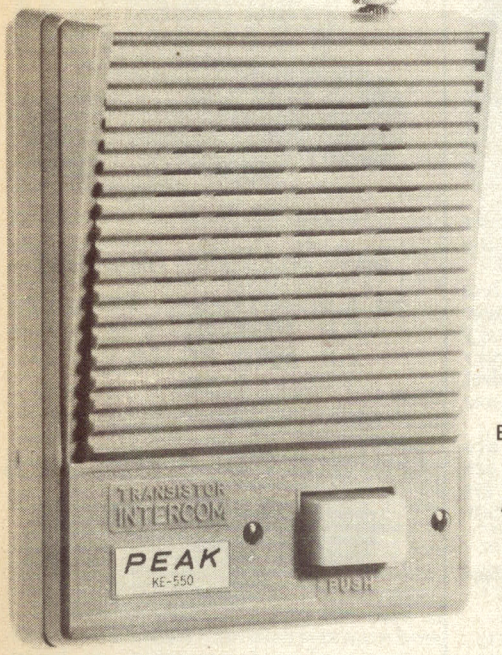
However, Audiosound Electronic Services will manufacture these units against special order for those who may have a particular need for a loudspeaker of this type.

Further information on the LD 30 Mk II may be obtained from Audiosound Electronic Services, 35 Heather Street, Collaroy Plateau, NSW 2098.

PEAK TRANSISTOR INTERCOMS

2 STATIONS $12.95*
3 STATIONS $18.75*
4 STATIONS $24.50*

*Suggested retail price only, complete with battery.



SPECIFICATIONS

Circuit — 2 station — 2 transistor solid state. 3, 4 station — 3 transistor solid state.

Station control — Push button press talk system.

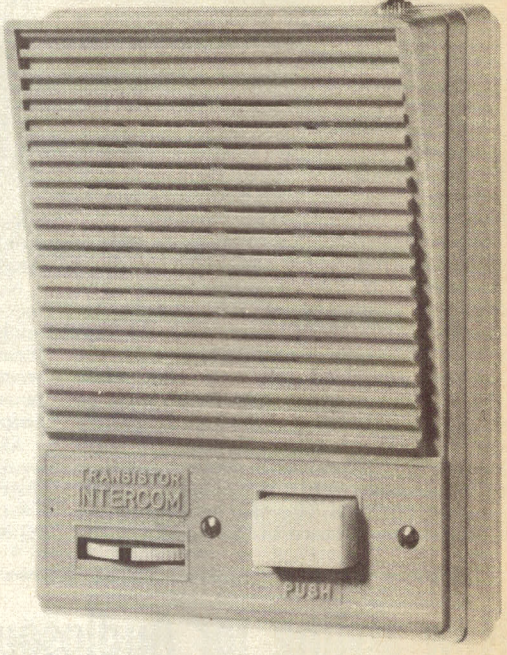
Output — 50 mW.

Speaker — 2¼" dynamic, both master & sub stations.

Case — two tone plastic for desk or wall use.

Battery — 1 standard 9 volt.

Size — 4" H x 3" W x 1¾" D.



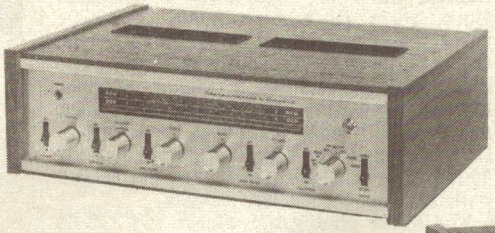
AVAILABLE FROM

H. ROWE & CO. PTY. LTD. SOLE AUSTRALIAN AGENTS

adelaide brisbane hobart melbourne perth sydney

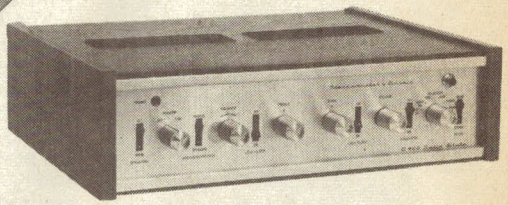
NEW ALL-TRANSISTOR STEREO AMPLIFIERS WITH IN-BUILT A.M. TUNER ULTIMATE IN DESIGN— LONG DEPENDABILITY using all silicon transistors 40 WATTS — RMS

SPECIFICATIONS:
20 watts per channel R.M.S. Total output 40 watts R.M.S.
FREQUENCY RESPONSE:
From 20 cycles to 20,000 ± 1db.
HARMONIC DISTORTION:
Less than than 1 per cent at rated output.
HUM AND NOISE:
Aux. 70db. Mag. 0db.
INPUT SENSITIVITY:
Mag. 3mv. Aux. 200mv
SPEAKER IMPEDANCE: 8 ohms.
EQUALISED: Mag. RIAA.
TONE CONTROLS:
Bass, 50 c/s ± 12db Treble 10 kc/s 12db.
LOUDNESS CONTROL:
50 c/s 10db.
SCRATCH FILTER:
(High filter) at 10 kc/s 9db.
RUMBLE FILTER:
(Low filter) at 50 c/s 5db.
PROVISION FOR TAPE RECORDER:
Record or play-back with din plug connection.
PROVISION FOR HEAD PHONES:
With headphone/speaker switch on front panel.
DIMENSIONS:
16½in x 5½in x 11in deep.
TUNER:
This unit "is supplied with a" transistor tuner with a coverage of 530 to 1,600 K.C. Calibrated dial available for all States.
THE CIRCUIT INCORPORATES regulated power supply with tansistor switching protection for output transistors, 26 silicon transistors plus 5 diodes are used.



$139.00 Plus Freight (cabinet extra)

Model C300/20/T (with Tuner)



$112.00

Plus Freight (cabinet extra)

AMPLIFIER ONLY. Specifications as above but with the added feature of front panel switch which allows selection of two speaker systems.

Model C400/20

Cabinets for above in teak or walnut with metal trim, $10 extra.

THE NEW MAGNAVOX 8-30 SPEAKER SYSTEM

COMPLETE SYSTEM: (1.6 cubic ft.) IN WALNUT OR TEAK VENEER, OILED FINISH, (Regret no mail orders for complete system.) — **$60.00.**
SPEAKER KIT: (Less cabinet.) COMPRISING 1 8/30 SPEAKER, 2 3TC TWEETERS, 1 3" TUBE, 1-4 or 2 mfd. CONDENSER, INNERBOND AND SPEAKER SILK, AVAILABLE IN 8 OR 15 OHMS. **$29.50** Postage $1.50 extra.

CLASSIC RADIO

245 PARRAMATTA ROAD, HABERFIELD NSW PHONE 798 7145

COMPACT HEAVY DUTY RELAYS

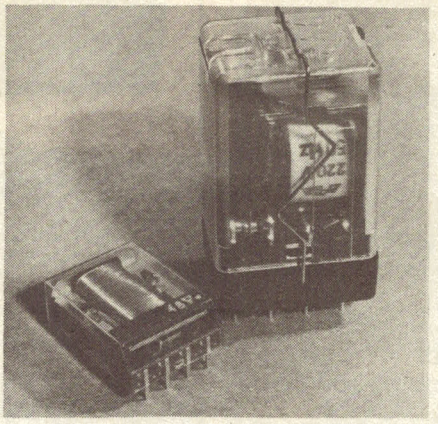
E.S. Rubin & Co has announced the availability of two new series of relays manufactured by PASI of West Germany.

Series PS compact heavy-duty relays are fitted with 1, 2 or 3 high-current changeover contacts and come in two basic types: type PS / GD for connecting into matrix board or printed wiring board (2.5mm pitch), and type PSGD / SK which plugs into a special socket. Both types, which are otherwise identical, are available in AC and DC coil versions with operating voltages from 6 to 220V.

Brief technical data for the PS relays are as follows: operating power — pull-in, 1.2W DC, 2.5VA AC; maintain, 0.55W DC, 2VA AC; Ampere-turns, 219 DC, 346 AC; operating time, 13-24ms DC, 6-14ms AC; release time, 12-20ms DC, 7-20ms AC; test voltage between coil and body, 2kV DC and AC; life expectancy, not less than 30-million operations; contact ratings — power, 44W at 220V to 120W at 30V DC, 1.2kW AC; voltage, 250V DC and AC; current, 6A DC and AC; test voltage between contacts, 2.5kV.

The board-relay type 5200 is a miniature unpolarised DC relay specially constructed for direct mounting on printed wiring boards of 2.5mm pitch. It is available with operating voltages from 6 to 60V, and measures only 30.1mm long x 22.4mm wide x 10.3mm high.

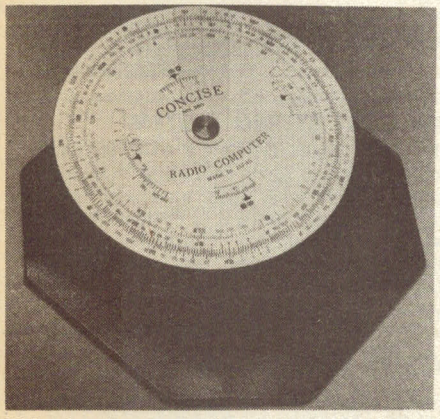
Brief specifications of the 5200 are: number of contacts, 4 change-over; max operating frequency, 50 operations / sec; max mechanical life, 10-million operations; test voltage, contact to contact and contact to coil, 750V 50Hz for 1s; operating time, approx 4.0ms; release time, approx 1.5ms;



max switching voltage, 250V; max switching current, 2A; max switching capacity at 150 to 250V, 75VA, at 30 to 150V, 30VA, at 0 to 30V, 45VA; max switching capacity at 150 to 250V and operating up to 50 operations-second, 20VA.

Further information may be obtained from E. S. Rubin & Co Pty Ltd, PO Box 143, Crows Nest, NSW 2065.

Electronics slide rule



This handy pocket-sized 4½in diameter circular slide rule has been specifically designed for the use of radio and electronics engineers. It has scales to enable the following functions to be speedily calculated: surge impedance — resonant frequency — inductive reactance — capacitive reactance — wavelength / frequency conversions — dB levels. The device has been strongly constructed of heavy gauge plastic material and is supplied with plastic carrying wallet and instructions. The price is $7.00, post free, from Watkin Wynne Pty Ltd, PO Box 392, Crows Nest, NSW 2065.

TRADE RELEASES — in brief

Solid-state video monitors; manufactured by Electrohome, Canada, are offered with 9in, 11in and 23in screen sizes with a 10MHz performance and a variety of standard features including separate sync input, underscan, VTR time constant switch, etc. Cabinets are constructed of heavy gauge metal components. Rack units are finished in blue, and the table model has a base in the same blue with a complementary beige case. Graphics on all models are in easy-to-read white. A panel designation strip lights when the monitor is on.

AWA Rediffusion Pty Ltd, PO Box 96, North Ryde, NSW 2113.

Vidicons and image pick-up tubes. A comprehensive range has been introduced by Siemens for TV studios, industry and home receivers. Special versions are available for particular applications such as night vision TV, surveillance systems, and computer character reading.

Siemens Industries Ltd, 544 Church Street, Richmond, Vic 3121.

Schottky TTL ICs, 82S series, feature PNP inputs and outputs clamped by Schottky diodes. Designed and developed by Signetics Corp, USA, the new TTL circuits employ full Schottky-barrier-diode clamping to achieve ultra-high speeds previously attainable only with emitter-coupled logic, yet they retain the desirable features of (and are completely compatible with) most popular saturated logic circuits. Typical propagation delay of 82S circuits is 3ns per gate, and power dissipation is 20mW per gate.

The 82S series initially includes 16 members: 82S30, 31 and 32, 8-input digital multiplexers; 82S33 and 34, 2-input 4-bit digital multiplexers; 82S41, quad exclusive OR element; 82S42, 4-bit quad exclusive NOR element; 82S50 binary-to-octal decoder; 82S52, BCD-to-decimal decoder; 82S62, 9-bit parity generator and checker; 82S66 and 67, 2-input 4-bit digital multiplexers; 82S70 and 71, 4-bit shift registers; 82S90, high-speed presettable decade counter; 82S91, high-speed presettable binary counter.

Tecnico Electronics, PO Box 12, Marrickville, NSW 2204.

Lithium organic batteries will be manufactured and marketed throughout the world by P.R. Mallory & Co Inc, USA, under the patents and technologies of

NEW RANGE OF RESISTORS CONDENSERS AND POTENTIOMETERS

CARBON RESISTORS

Current type resistors by Philips, IRC, Ducon & Morganite in a wide range of values from 100 ohms to 10 meg. ½ and 1 watt
$1.50 per 100 Post 30c Extra

MIXED CONDENSERS

The condensers are in most popular brands and include polyester, paper, mica ceramic and electrolytic on values to 8mfd.
$1.50 per 100 **Post 50c extra**

CERAMIC CONDENSERS & THERMISTORS

A large range of current disc & tube ceramic condensers & thermistors.
$1.50 per 100 **Post 30c extra**

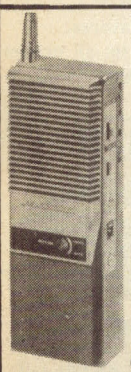
POTENTIOMETERS

The pots are all current types and include switch pots, standard pots, pre-set etc.
$1.50 per doz. **Post 50c extra**

REGRET SPECIAL VALUES IN RESISTORS, POTS, & CONDENSERS CANNOT BE SUPPLIED.

NEW BATTERY OPERATED BURGLAR OR DOOR ALARMS AT HALF PRICE

These alarms operate on two 1½v batteries which are supplied and are suitable for mounting on doors, windows, drawers etc and give a very loud signal when set off.
$1.95 Post 25c



At last a breakthrough in the cost for high quality portable radio transceivers of the walkie-talkie hand-held type. We are introducing and offering for sale a fully PMG approved

MIDLAND 1 WATT TRANSCEIVER

for 27,240KHz operation with switch provision for two additional channels, tone call signal, background noise squelch control, battery voltage indicator, steel case with separate cover, good for five miles distance communication under average field conditions, with penlite cell-batteries for

ONLY $39.95 PER UNIT, FULLY GUARANTEED.

MAGNAVOX WIDE RANGE TWIN CONE SPEAKERS

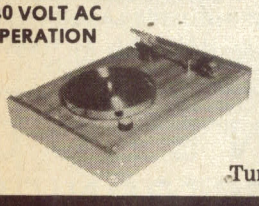
8 on 16 ohms VC. Post and packing 65c

6WR MK V 12 Watts RMS **$9.90**
8WR MK V16 Watts RMS **$10.75**
10WR MK V 16 Watts RMS **$11.50**
12WR MK V 16 Watts RMS **$12.50**
8-30. 30 Watts RMS. **$18.50**
3TC Tweeters **$3.75**

SPEAKER SPECIAL
Imported Tesla 8" Speakers. 8 ohm imp. **$4.75.**
Post and Packing 65c.

NEW IMPORTED STEREO TURNTABLE AND PICK-UP

240 VOLT AC OPERATION



3 speed turntable with ceramic stereo pickup counter-balanced tubular arm, **$7.90.** Base in teak or walnut, **$6.50** extra. De luxe base **$8.50** Post 50c or $1.00 with base.

Turntable and motor separate **$4.50**

21 WATT P. A. AMPLIFIER — MIXER

As featured in June issue **Electronics-Aust.**

complete kit of parts.
$57.00 **Post Extra**

Wired & Tested $10.00 extra

NEW COLUMN SPEAKERS

Suitable for above Amplifier in walnut finished cabinet containing four 8" Rola Speakers Imp. 8 ohms.
$37.50 **REGRET NO MAIL ORDERS**

NEW GARRARD RECORD CHANGERS MODEL 1205

4-speed manual or automatic operation fitted with Garrard Crystal Pick-up. **$25.00**

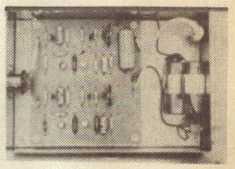
Post & Packing **$2.50** extra (Reg. Post)

LEADER SIGNAL GENERATOR LSG11

240V A.C. operated, 6 band 120KC to 390 Megs. Provision for crystal **$49.50**
Post NSW, 75c; Interstate, **$1.25.**

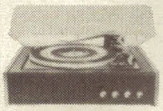
A TRANSISTOR PREAMP FOR MAGNETIC PICKUP OR TAPE HEAD

Using 2 transistors per channel, as featured in "Electronics Australia" (Sept. 1971). Complete kit includes transistors, PC board, resistors, capacitors.
Circuit and full details supplied.
Kit (not incl. box) **$7.90**
240V Power Supply **$4.50**
Metal box **$2.00** extra.
State if required for pickup or tape head.



NEW LOW COST STEREO SYSTEM

AS FEATURED IN JAN. ELECTRONICS AUSTRALIA

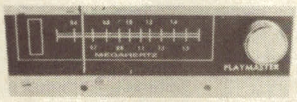


Complete kit of parts including "Garrard" record player with auto. stop and crystal pick-up. Magnavox 8WR or 6WR wide range twin coned speakers. (Cabinets not supplied). Amplifier only, less speakers and player. **$32.00**

$69.50 Post and packing $2.50 extra.

POLYESTER CAPACITORS

Pack of 100 new polyester capacitors .001 to 0.1 in 160, 250 and 400 volts working. **$3.50** Plus 50c Post and Packing



BROADCAST TUNER KIT

$22.50
Post 75c

Complete kit of parts including dial mechanism and zener diode for this I.C. tuner as featured in Feb. 71 E.A.

NATIONAL RADIO SUPPLIES

332 Parramatta Road, Stanmore, NSW 2048 Phone 56 7398

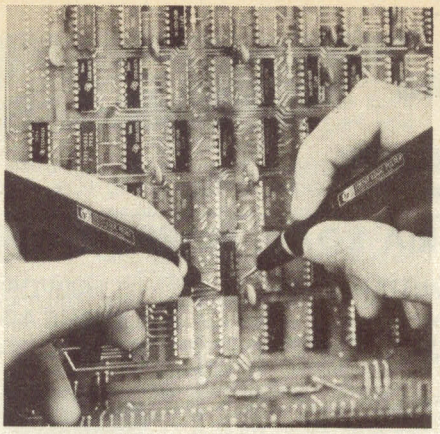
Logic Test Devices

Two new logic test devices from Hewlett-Packard together form a stimulus-response test set for less than $200 and with a size no more than two pens. Together or alone they add ease and speed to troubleshooting digital equipment, in design, production or service.

The logic pulser, model 10526T, without unsoldering or otherwise opening a tested circuit, automatically drives any node to the opposite state for 400ns. With its very low source impedance (2 ohms) and high current delivering capacity (750mA), it can reverse the state of any node, even those that are highly noise resistant. The pulser automatically selects the correct polarity, and presents an output impedance above 25k as long as it is not pulsing.

The logic probe, model 10525T, will detect bad levels and open circuits, and will capture "high" and "low" pulses as short as 10ns, whilst maintainging input impedance above 25k. Display is unambiguous — a ring of light around the base of the probe. An unlit lamp means the state is low, full brilliance means high, and half brilliance means an open circuit or bad level. A blinking light indicates a pulse train (up to 50MHz). Short pulses (down to 10ns) of infrequent occurance are stretched to 50ms "blinks" for clear visibility.

The devices will indicate if a gate is functioning, if a pin is shorted to earth or Vcc, if a counter is counting,



and so on. If the gate is functioning, the pulser's output will be transmitted through the gate and then stretched by the probe so as to be seen clearly. With probe and pulser on the same pin (output or input) failure of the pulse to light the probe will indicate that the pin is shorted to earth or Vcc.

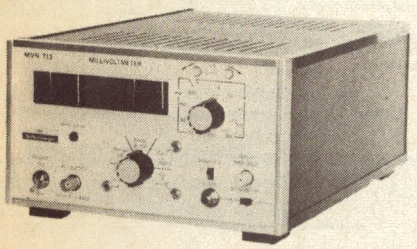
American Cyanamid Co under the terms of a recent agreement. Mallory Batteries (A'sia) Pty Ltd will market these products in Australia in 1973. Mallory is also developing other lithium battery systems, including a family of solid-state batteries from 2 to 200V or higher, with potential use in medical electronics, clocks, military devices, and other applications where high voltage density and reliability are required.

Mallory Batteries (A'sia) Pty Ltd, 3 Chilvers Road, Thornleigh, NSW 2120.

Instruments, manufactured by ITT Matrix, France, are now available in Australia exclusively through Tecnico Electronics. The Matrix range includes multimeters, digital RF generators, sweep generators, light meters, and oscilloscopes. Matrix has also recently release four integrated circuit testers.

Tecnico Electronics, PO Box 12, Marrickville, NSW 2204.

Digital RF millivoltmeter, model MVN713, measures low level AC voltages from 10mV to 300V in 10 ranges over a frequency range from 20Hz to 10MHz with a typical accuracy of 0.1% of reading ±1 digit. A resolution of 1 part in 1500 with 10uV sensitivity is of-



fered, and display is either voltage or decibel (selected by push-button). Both analog and BDC outputs are available, and in addition the instrument may be used independently as a wide band amplifier.

Schlumberger Instrumentation Aust Pty Ltd, PO Box 138, Kew, Vic 3101.

Mercury and alkaline cells, and recording tapes manufactured by Mallory are now distributed by Industrial & Medical Electronic Co. This company has also been appointed distributor for Everest antennascopes and reflectometers.

Industrial & Medical Electronic Co, 288 Little Collins Street, Melbourne, 3000.

Video processing equipment, manufactured by Colorado Video Inc, USA, is now available in Australia through Ronald J. T. Payne Pty Ltd. The range includes video analysers, bar graph generators, video converters for transmission over voice grade lines, video memories (disc recording), a video plotter, and various special purpose generators.

Ronald J.T. Payne Pty Ltd, 385-387 Bridge Road, Richmond, Vic 3121.

Cable manufactured by Felten and Guilleaume AG, West Germany, is now available through Tecnico Electronics. The products of Felten and Guilleaume include power cables for all voltages, insulated wires and cables, telecommunication and RF cables, cable jointing equipment, voltage converter equipment, electric motors, electric lifting magnets, leak detectors for mineral oil tanks, high voltage phase testers and indicators, cable test sets, locators, and fault locators.

Tecnico Electronics, PO Box 12, Marrickville, NSW 2204.

Leasing arrangements for Philips scientific and industrial equipment are now being offered following the acquisition of a 14.4% interest in Mutural Acceptance Ltd by Philips Industries Ltd. Philips manufactures a wide range of scientific and industrial equipment, including pollution control systems. The company expects that the latter will be a growth area for leasing because of stringent anti-pollution measures introduced recently.

Philips Industries Ltd, GPO Box 2703, Sydney, 2001.

Precious metal preforms, manufactured by Consolidated Reactive Metals, USA, are now available in Australia through Machinery Indents Pty Ltd. Consolidated Reactive Metals specialises in the production of fine diameter precious metal wire preforms and is a major supplier of specialised precious and base metal components, wire and foil for electronic and other critical applications.

Machinery Indents Pty Ltd, PO Box 132, East Melbourne, Vic 3002.

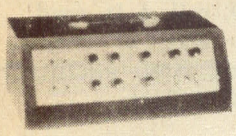
Instruments manufactured by Teb-Huber Ltd, West Germany, are now available in Australia through Tecnico Electronics. Teb-Huber manufactures RF spectrum analysing recorders, and field strength spectrographs and recording systems, suitable for the automatic recording of certain radio spectrum parameters.

Tecnico Electronics, PO Box 12, Marrickville, NSW 2204.

Variable speed motor drives. IRH Industries Ltd has concluded an agreement to take over the operations of Thorn MI Australia Pty Ltd with respect to variable speed motor drives and related control equipment. The newly acquired activities will be integrated into the operation of the equipment division of IRH, which already manufactures a wide range of equipment and control systems for industry. In addition, IRH has agreed with Thorn Automation Ltd, UK, to represent and manufacture under licence in Australiasia the entire range of products and systems which Thorn Automation offers for industrial equipment and process control requirements.

IRH Industries Ltd, The Crescent, Kingsgrove, NSW 2208.

50 WATT SOLID STATE GUITAR AMPLIFIER



50 watts RMS. solid-state guitar amplifier PM125 4 inputs, 2 channel with separate volume, bass and treble controls; speed and intensity controls for vibrato. Remote foot switch with plug and lead. Black vynex carry cabinet. Kit of parts **$98.00**
Fully constructed and ready for operation off 240VAC **$114.00**

GUITAR SPEAKER CABINET

Upright floor model, black vynex covering, 34" x 18" x 12", sloping front, contains innerbond packing and two Rola 12u50 12" speakers.

$115.00

CURLED CABLE

Extends to 20ft Standard 6.5mm phone plug each end: **$3.50**
Pack & post. **25c**

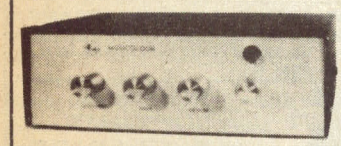
12 CORE P.V.C. CABLE

3/8" diameter. 10/ 010. 12 colours. **40c** per yard.

TWIN SPEAKER FLEX

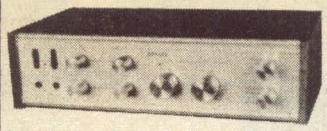
7/ 010. Striped. **$4.75** per 100 yards. P&P 75c.

MUSICOLOUR II



As per E.A. Dec. '71, Jan. '72. Complete
kits of parts **$49.50**
Fully constructed **$59.50**
Pack & post **75c**

P.C. BOARD ONLY **$3.25**
SPECIFIED TRANSFORMER ONLY **$4.35**



SONATA NS-1600D

All silicon solid-state Hi-Fi Stereo Amplifier. 10 watts RMS per channel. Each channel has separate Bass Treble controls. Inputs for magnetic or ceramic cartridge, crystal mic., radio, tape — tape out, stereo headphones. 8 — 16 ohms. Instruction booklet, circuit supplied. Timber cabinet. Dimensions: 14½" x 8" x 4". Price **$67.50.** Pack and Post $1.50. Interstate $2.50.

HI-FI STEREO HEAD PHONES

Freq. 20-12000 Hz
Imp. 8 ohms
Complete with lead and standard stereo phone plug.

$5.25

Pack and post 35c

PHILIPS

1" dome tweeter
$12.00
P & P 75c

LOCK-DOWN CAR AERIAL

Complete with shielded cable, plug, mounting bracket, key. **$3.50.** P.P. **50c.**

CAR SPEAKERS

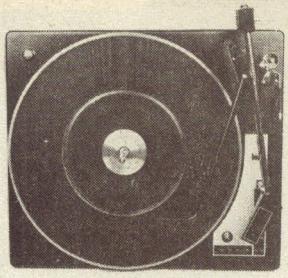
5", 8 ohms, 5 watts. Suitable for radio, cassette or cartridge. Also extension. **$7.75** each or **$15.00** pair. P.P. 75c.

8 TRACK BLANK CARTRIDGE

70 mins —	**$3.75**
80 mins —	**$4.25**
Head Cleaner —	**$2.95**

STEREO RECORD CHANGERS

C129— C141 — C142 — C142A3



Current models, 4 speeds, automatic or manual operation.

Ceramic cartridge, Sapphire stylus. Standard model with 12in turntable **$34.00**

Deluxe model with 12in turntable, Cueing device, ceramic cartridge, diamond stylus **$40.00**

Deluxe model as above with - adjustable counter balance, 2 spindles, calibrated stylus pressure control added **$46.50**

Deluxe model as above with 12in Diecast Heavyweight turntable, 4-pole shielded motor, sutiable for Magnetic cartridge **$56.50**

The latter two record changers can be supplied with magnetic cartridge and diamond stylus at $10 extra

MOUNTING PLATFORMS

Pre-cut to suit the above changers and BSR player or blank. 18¼" x 15" x 3½" walnut or teak. **$9.00. p.p. 75c**

PERSPEX COVERS

Fully moulded, smoke tinted. 17¼" x 13½" x 4½". **$9.00. p.p. 60c.**

BSR MINICHANGERS

4 speed-stereo-ceramic cartridge sapphire stylus 240V AC **SPECIAL PRICE**

$24.75 P & P **$1.25.**

Also available is the standard model BSR Stereo Record Changer **$24.75** P & P $1.50

STEREO RECORD PLAYER

240V AC — 4 speeds, ceramic cartridge. Separate motor, 7in turntable, pickup arm and rest. Post 50c.

$7.90

Rotating Distress Emergency Beam

Fire Brigades and Rescue squads use them. So do Car, Truck and Boat owners who value their safety. At home on party nights, have a light show. Red, Blue, Amber — visability ½ mile. 12v D.C. 1 amp operation, waterproof. Complete with heavy duty suction cap. Size 3½" dia. x 5½". **$5.75.** Pack and post 35c.

GARRARD STEREO RECORD PLAYER

3 Speeds, Auto-Stop Sonatone HiFi Ceramic Cartridge Included.
$15.50

Pack and Post NSW $1.00.
Pack and Post Interstate $1.50.

MAGNAVOX WIDE RANGE TWIN-CONE SPEAKERS

8-16 ohms
30-16000 Hz.

6WR MK5 12-W RMS	**$ 9.90**
8WR MK5 16-W RMS	**$10.75**
10WR MK5 16-W RMS	**$11.50**
12WR MK5 16-W RMS	**$12.50**

Pack and Post 65c.

Send SAE for Data Sheet.

REVERBERATION UNITS

Deluxe model.
Freq. response. 60-5500Hz.
Decay time at 300 Hz 2 seconds.
Dimensions 16¾in x 4⅜in x 1¼in.
$19.95

NEW STEP DOWN TRANSFORMERS

240V AC/ 110V AC 250 watts

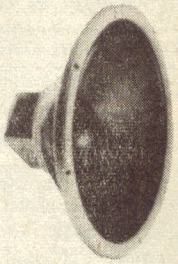
$12.50
P & P $1.50

ELECTROS

4000 uF 80VW	**$3.25**
2000 uF 50VW	**1.60**
1000 uF 50VW	**1.25**

TOP QUALITY AUST. MADE SPEAKERS

12in Wooter 20 watts RMS	**$24.25**
12in Wooter 15 watts RMS	**$22.00**
12in Twin cone 15 watts RMS	**$19.00**



15" PIONEER

15in Pioneer low frequency speaker, Imp 8 ohms. Power, 30 watts, RMS designed especially for use with bass guitar or electric organ. Also ideal for stereo woofer speaker

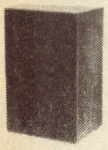
$33.00

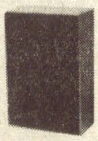
ROLA 50 WATTS RMS

(Special purchase)
Model 12U50 12inch

24Hz — 11KHz 8 or 16 ohms **$35.00**
12UX50 12inch hi-fi extended frequency **$40.00** Incl. Post.

SPEAKER ENCLOSURES





NEW MAGNOVOX 8.30 SYSTEM
Ref. Jan. '71 E.A.
1.6 C.F.T. 30 watt. 8.6 ohms.
Complete ready for use.
$60.00 ea.

8.30 speaker only	**$18.50**
3TC Tweeter only	**$3.75**
Cabinet only	**$30.00**

HI-FI SYSTEM with 8WR MKV and 3UC tweeter
16 watts, 8-16 ohms, 22in x 14in x 8in.
$43.75 ea.
Hi power system with MSP 12UAX and 2MBC tweeter. 23½in x 17in x 12½in. 20 watts **$53.75 ea.**

FAMOUS MULLARD MAGNAVOX
Bookshelf enclosures
6WR MKV and 3UC tweeter, 8-16 ohms, 15½in x 8¼in x 8½in.
Complete ready for use.
$26.75 ea.
Cabinet only **$13.95**

All cabinets are constructed of Pineboard and veneered with oiled teak Formica and are complete with cross over network — tweeter — innerbond packing.

The World's Most Versatile Circuit Building System!

SIZES: 1 / 8" and 1 / 16" WIDTHS

Length: 100 ft. roll, 5 ft. card

IDEAL FOR PROTOTYPE AND PRODUCTION CONSTRUCTION

USEFUL FOR WIRING REPAIRS

• **NO DRILLING** • **FAST** • **NO MESS**

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ZEPHYR

Manufacturers of Radio and Electrical Equipment and Components

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New All Silicon 30 / 60W PA PORTABLE AMPLIFIER

12-16V, two inputs, 5mV and 100mV. Dimensions 6½in W x 3¼in H x 8½in D. 15-ohm output, No 763D, $62. For 125, 250, 500-ohm output, No 763A, $64. For 240V operation $33 extra.
10W PA amplifier similar to above, 4-ohm output, 240V operation, No 729D, $40. Freight extra.

CD IGNITION COIL

For EA (Fraser) circuit. Mounted on strong fibreglass printed circuit coded for all other components. Polyester film layer insulation. Connected and tested. For standard distributor, No 787; for photo cell distributor, No 786. $8 each. Postage 20c each.

R.C.S. COMPLETE DO-IT-YOURSELF KITS

Peak reception. Low price. No expensive test equipment. Everything fits. 1964 RF Transporta 7.

Complete kit — No 640 $43.50
Portable car radio. Identical to 640 above, plus extra switch and car coil, etc. No. 642 $46.00
Postage $1.
(Write for booklet on 640 and 642.)

NEW TRANSISTOR PREAMP KIT

SIZE 3 x 2 x 1in, 2 req. for stereo.

LOW IMP input, 2 trans, 672C	$6.50
Wired ready for use, 672D	$8.00
HIGH IMP, 2 trans, 680C	$6.50
Wired ready for use, 680D	$8.00
HIGH IMP silicon, 3 trans, 682C	$8.00
Wired ready for use, 682D	$9.50

Postage 10c each. Write for data.

COILS and IFs 455KHz

Aerial, RF, Osc and IFs	$2.00
Ferrite aerial	$2.40
No. 265 Universal tape Osc coil	$6.00

Postage 10c. Write for details and price.

ALL PRINTED CIRCUITS SINCE 1960 now available

Clearly coded for easy assembly. Accurate to size. With parts list. Immediate despatch.
- Accurately machine printed and edged.
- Specials to your drawing.
- Phenolic or fibreglass — gold or tin plated.
- Special manufacturers packs of 10.
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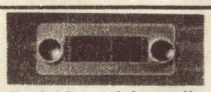
- Add 20c postage.

All printed circuits for EA, R & H, ET, Philips and Mullard projects available.

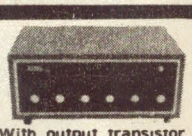
LATEST P.C's

831 ENA 72/P3	827 ET021	834 ET026	801 Philips
829 ENA 72/T2D	828 ET023	795 ET025	$2.80 ea
805 ENA 72/P6	830 ENA 72/R2	835 ENA 72/T3	806 ENA 72/A6 $2.30
$2.00 ea	832 ENA 71/A8	836 ENA 72/MX6	800 ET 034 $2.60
			808 ENA 72/C2 $3.50

HI-FI BROADCAST TUNER UNIT 4 TRANSISTORS—HIGH SENSITIVITY



RF mixer, IF, power detector stages, adjustable aerial coupling. Complete as illust, wired and tested with 461 dial, knobs and switch pot, No. 474D, $31. Freight extra.
WHISTLE FILTER for above set for 8KHz bandwidth. (Can be altered to 9, 10 or 11KHz.) No. 128, $4. Post 10c.



10W STEREO
MULLARD
10 + 10W RMS

With output transistor PROTECTION. Frequency response 40Hz to 30KHz. Distortion 0.5 per cent. Treble, bass boost, 20dB.

Complete kit of parts, No. 480C	$74.00
Wired and tested, No. 408D	$79.00
Cabinet as illustrated	extra $10.00
Magnetic pickup preamp, No. 762D	extra $11.50
Inbuilt BC tuner with w / filter	extra $35.00

Plus freight. Write for brochure. For special Saturday demo, ring 59 6550.

TRANSFORMER

Tap 6V and 9V at 100mA. Filter capacitors, rectifier, resistor, etc. $6.50. Post 20c.

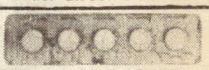
NEW STEREO MAGNETIC PREAMP

Hum free, 5mV input, 250mV out. Size 3 in x 2in x 1in. Wired ready for use. No. 762D. $11.50. Post 10c.

NOISE FILTER
for radio and TV

No. 27 line filter, 2A	$8.50
No. 29, 10A. No. 29B, 20A line filter	$35
No. 30 pulse filter, 2A	$11.50
No. 11 aerial filter	$13

Order direct. Pack and post 50c.



MAGNETIC STEREO PRE+AMP

In 5mV, out 250mV. Bass and treble 20dB

No. 724C	$29
Wired ready for use	$31

Postage 30c each.

For crystal, ceramic, No. 722D	$27

NEW BASS BOOST
4-TRANSISTOR STEREO AMP

Unity Gain:
400Hz, 0dB
100Hz, 5dB
50Hz, 9dB
30Hz, 14dB

Connect between your preamp and main amp
No. 791D, $10.80.
Postage 20c.

LATEST PRINTED CIRCUITS

779—70.R.D.1	$3.00
780—70.P.A.1	$3.00
790—70.H.P. 1	$3.00
783—71.T.U.2	$2.00
766—773—789—71.R.1	$2 ea
796—71.S.A.4.A	$2.50
	$2.50
798—71.S.A.4.C	$3.00
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R.C.S. Order by mail. Cheque or Money Order (add postage) direct to:—
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AMATEUR BAND NEWS AND NOTES

by Pierce Healy, VK2APQ

Work of the Monitoring Services

The function and purpose of official monitoring stations are far removed from those often attributed to them by some amateur radio operators.

The service which monitoring stations provide is given very little publicity and is therefore not appreciated by some amateur operators and much less by the public in general. More often than not, the only time an amateur operator thinks about them is when he receives an official "QSL" drawing attention to a digression from the regulations.

Amateur operators, however, are not singled out to be the only recipients of official "QSL's".

The general public have little knowledge of the work done to ensure that all broadcast and television stations adhere to the technical standards laid down. The same applies to the users of other forms of radio communication. Yet it's true to say that every person in a modern society is in some way dependent on national and international radio communication.

In 1927 a World Radio Conference at Washington, USA, produced a table of frequency allocations covering the frequency range from 10KHz to 23MHz. The services catered for were Fixed, Mobile, Broadcasting and Amateur. The next conference, in 1932 at Madrid, drew up the first table of transmission frequency tolerances. At the Cairo conference in 1938, the table of frequency allocations was extended to 200MHz.

The Atlantic City conference in 1947, the first after the second world war, had to cope with the technical advances stimulated by the war and the requirements of the 76 participating countries. At this conference the upper limit was fixed at 10.5GHz. This was raised to 40GHz in 1959 at the Geneva convention.

In spite of the progressive extension into the very highest frequency range, congestion, particularly in the region up to 30MHz, became a delicate and difficult problem. The Atlantic City conference adopted entirely new provisions governing spectrum use and frequency assignment. It also introduced the concept of monitoring. Article 18 of the Atlantic City Regulations (later Article 13 of the Geneva Regulations) set up an international monitoring system.

Also, the International Frequency Registration Board (IFRB) was set up, mainly to bring order into use of the spectrum. Its chief duties are as follows:—

a. to record frequency assignments made by different countries so as to fix the date, purpose and technical characteristics of each assignment with a view to ensuring formal international recognition.
b. to draw up frequency lists and other documents relating to the assignment and use of frequencies.
c. to collect monitoring observations from administrations and monitoring organisations.
d. to review periodically the entries in the Master International Frequency Register with the view of eliminating inactive entries.
e. to investigate harmful interference at the request of one or more interested countries, and to formulate the necessary recommendations.
f. to carry out studies of frequency utilisation and to recommend adjustments in assignments to permit establishment of new circuits.

The need for national monitoring services had been apparent to administrations interested in ensuring that their own stations were operating in conformity with national and international regulations and that national private stations were complying with licence provisions.

Monitoring stations have two distinct functions, one national and one international. Internationally they co-operate with stations belonging to other countries to solve specific problems, such as identifying an unknown source of interference. Also to supply spectrum occupancy data to the IFRB or provide information required for a specific purpose.

Because it is often impossible to draw a clear-cut distinction between national and international activities it is usual to treat monitoring tasks as all part of a single function, each administration determining how these tasks are apportioned between the national and international spheres.

Technical developments which are bound to give rise to new problems make it impracticable to list all the duties assigned to monitoring stations.

However, the general duties assigned to monitoring stations may be summed up under the following:—

— systematic measurement of the frequencies of national stations.
— identification and systematic measurement of frequencies of foreign stations liable to cause interference to national stations.
— systematic measurement of the field strength, the fundamental (to check radiated power) and the harmonics or other spurious emissions of national stations.
— measuring and recording the depth of modulation of national stations, or other stations for which reception conditions are sufficiently stable.
— measuring bandwidths of national stations and, occasionally, foreign stations liable to interfere with national stations
— analysing the operating conditions of foreign stations when they appear to be interfering with national stations.
— analysing the operating conditions of foreign stations if they are liable to interference as a result of a new national frequency allocation.
— carrying out oral and visual observations of the whole radio spectrum with a view to detecting spurious emissions, or emissions from unlicensed national stations which do not identify themselves properly, and in order to check that the operating schedules and traffic handled by national stations comply with the terms of the licences issued.
— maintaining a systematic listening watch on 500KHz and 2182KHz for safety purposes and to check that stations in the mobile service cease transmitting on these frequencies during the periods laid down.
— keeping a permanent record of occupancy of the radio frequency spectrum to help in choosing frequencies for new assignments.
— participating in the IFRB monitoring programs.
— co-operating with international organisations by making measurements and observations on request
— co-operating with other monitoring stations to help trace and identify interference.
— radio direction-finding, to help identify interfering stations or stations operating illegally.
— making observations or measurements required by the technical services for special studies.

To cover the propagation characteristics peculiar to each frequency band, it is necessary to have either fixed monitoring stations scattered throughout the country or mobile stations. The work for national purposes is generally far more extensive than the work of the international monitoring system. It is really only necessary to sort out, from the overall results, the data of value to the international system.

Many factors have to be taken into account when selecting a site for a monitoring station, such as frequency bands and geographical areas to be covered. Requirements for special installations such as long range direction finders, co-sited transmitters, freedom from man-made static, suitability of terrain and facilities for staff also have to be considered.

If the station will be concerned primarily with frequencies below about 30MHz, someqhat greater latitude is allowable than for higher frequency coverage of a particular metropolitan area.

Likewise if a co-ordinated network of long-range direction finders is planned, adequate baselines between the individual stations must be provided.

Minimum site criteria are set down for type of soil, existing or potential residential or industrial districts, industrial plants using electrical welders, heating devices, diathermy equipment and other devices.

Equipment needed for a monitoring station to function must be maintained at the highest level performance, and be equal to world standards. Often older type of equipment, proven by years of service, is used as an adjunct to modern type units using current state of the art design and components. Frequency standards have an accuracy of 5 parts in 10^9.

Personnel must have a background in communications, a wide knowledge of the regulations, tolerances, and identification of the various classes of emissions. There are thirty-seven classes of emission listed in the Radio Regulations.

These notes were based on some of the points raised during an inspection of the Postmaster General's Department monitoring station in Sydney by members of the Sydney Chapter of the Quarter Century Wireless Association. Also, from the discussion at an informal gathering of QCWA members following their March monthly meeting, with Mr Ron Holt, a senior officer of the Radio Branch. These events were reported in the June issue of these notes. Extracts from ITU, CCIR recommendations for monitoring stations are also included.

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent direct to Pierce Healy at 69 Taylor Street, Bankstown, NSW 2200.

WIA ACTIVITIES

Following a decision at the 1972 Federal Convention to review repeater frequency asignments much work has been done by various state committees. A meeting to discuss proposals was to be held at Wodonga on Saturday 8th July. It was expected that this meeting would make recommendations for action by the various divisions in relation to VHF band planning.

NEW SOUTH WALES
VHF & TV Group Contest

The Contest Committee of the NSW Division VHF and TV Group invites national participation in a VHF — UHF contest to be held in August and thereafter annually.

The contest is similiar to that sponsored by David Tanner, VK8AU, in July, 1971. Like David, the committee thinks that contacts via sporadic "E" do not reflect the operator's use of "the state of the art" equipment and is unfair to those who are experimenting with scatter communications and weak signal techniques. For this reason, contacts via sporadic "E" and transequatorial propagation are disqualified.

The minimum distances specified are based on the normal range of "beginner" type stations running low power to relatively small antennas.

A trophy, to be known as "The John Miller VK2ANF Trophy", will be awarded to the outright winner, and certificates to the highest scorer in each state or territory of Australia.

Individual amateur stations only are eligible to enter. Club or society stations (eg Illawarra Moonbounce Project) are not eligible for the trophy or certificate but may provide the "other end" of a scoring contact.

RULES:

1. Duration: 0001 hours 4th August 1972 to 2400 hours 20th August 1972. (All times EAST). Note that the Perseids Meteor shower will occur during that period.
2. There is one division — transmitting only.
3. All individual amateur stations may enter, whether fixed, portable or mobile.
4. All VHF and UHF amateur bands may be used, but cross-band contacts are prohibited. Cross-mode contacts are permitted.
5. Only one contact per band per station is allowed for each EAST calendar day.
6. Entrants must operate within the terms of their licence.
7. Before points may be claimed for a contact, serial numbers must be exchanged. The serial numbers of five or six figures will be composed of RS (telephony) or RST (telegraphy) report plus three

figures commencing at 001 for the first contact and increasing by one for each successive contact.

8. On the 52MHz band, contacts via modes generally referred to as sporadic "E" and transequatorial propagation will be disallowed. The committee reserves the right to adjudicate doubtful cases. Contacts over distances below 50 miles (80kM) on bands 52MHz to 450MHz will be disallowed as will contacts below 25 miles (40kM) on bands 576MHz and above.
9. Scoring for all contacts will be based on mileage multiplied by a band factor, as in the following table:—

Band	Factor or Multiplier
52Mhz	1
144MHz	2
432MHz	3
576MHz	4
1215MHz	6
above 1300MHz	8

Each log entry must show the claimed milage and score.In the event of two stations disagreeing on milage, the average of the two estimates will be taken.

10. All logs must contain the following information:— Date and time (EAST)
Band; emission; power;
Call sign of station worked;
Serial number sent; serial number received;
Distance; points claimed.
11. Entries and logs should be forwarded to reach the Contest Committee on or before Friday 15th September 1972.

Send entries to:
The Chairman
VHF and TV Group Contest Committee
14 Atchison Street,
Crows Nest 2065
New South Wales.

Central Coast Amateur Radio Club

At the May meeting held at the clubrooms, Kariong, a most interesting demonstration of colour television was given by George Collie, VK2ZDC. A comment on the demonstration was that, without a considerable amount of "homework" by television service personnel, the coming of colour television would bring many problems. Equally obvious was the amount of work that George and his colleagues must have put in under rather difficult conditions to present such a demonstration.

A note in the June 1972 "News Sheet" of the Club, by the president Bill Smith VK2TS, sums up a current situation and gives some food for thought for amateurs who may not give much thought to the future of amateur radio.

"Keeping up with the times is becoming increasingly difficult in the field of electronics, the Amateur Service being no exception. The colour television demonstration given recently by George Collie, VK2ZDC; illustrated this extremely well.

"For those of us with only limited time to devote to the hobby it is all too easy to allow 'progress' to pass us by. Unfortunately, as always, Father Time is the enemy; but to survive we must try to fight him, and attempt to 'keep up'."

Visitors to the NSW Central Coast are invited to attend meetings of the club.

Full details of activities, including the Gosford Channel 1 repeater, may be obtained from the secretary, Dick Maitland, VK2BBK, PO Box 238, Gosford 2251, NSW.

VICTORIA

VHF Group

The Victorian Division VHF Group meets at 478 Victoria Parade, East Melbourne, on the third Wednesday of each month commencing at 8.00pm.

Other activities include:

144MHz scrambles, commencing at 8.00pm on the first Sunday of each month. The frequency is between 144.0MHz and 144.5MHz.

Fox hunts on the first Friday of each month. The frequency is between 144.0MHz and 144.5MHZ.

On Sunday 27th August, 1972 an antenna test day will be held. Facilities will be provided for accurate gain measurements, VSWR, and polar pattern of 144MHz and 432MHz antennas. The frequencies will be 144.1MHz horizontal, 146MHz vertical, and 432MHz horizontal. Other facilities may be provided by arrangement.

Non-members of the WIA, interested in VHF techniques, are welcome to participate in all activities which do not involve a direct cost to the Group or the institute as a whole.

Enquiries to:

The Publicity Officer
Geoff Robinson, VK3YER,
Telephone (03) 306 5333.

Eastern & Mountain Districts Radio Club

The second meeting of Club's Slow Scan Television Group, at the Mooroolbark Technical School on the 5th May, 1972, was attended by 40 persons. The chairman, John Wilson VK3LM, reported that enquiries were still being received by both mail and telephone regarding the group's activity. Several new members have joined the club as the result of the SSTV Group's publicity.

Guest speaker at the meeting was Stan Dixon, VK3TE, who demonstrated his imported SSTV equipment. Stan related some of the early history associated with SSTV in the United States and the United Kingdom. At first, 27MHz was used which was later changed to 30MHz. On that frequency, using AM, fading was a problem. Later, FM was used, while today SSB is used. Several suggestions were given regarding setting up call sign cards, black letters on a white background being the better. Tape recording at 3¾ inches per second is ideal.

The Eastern and Mountain Districts Radio Club presents a certificate, the Southern Cross Award, to amateur operators who make a two-way contact with club members. Conditions are:—

Australian and New Zealand stations must contact 15 EMDRC members. Contact with the club station VK3ER counts as two.

DX stations must contact 5 club members.

Band and mode endorsements are made.

The award is available to short-wave listeners.

General Certificate Hunters Club rules apply.

Contacts made subsequent to 0001 hours EAST on 1st July 1971.

When applying for the award please enclose 50 cents to cover postage within Australia and New Zealand.

DX applicants should send 8 International reply coupons.

The award will be issued free to blind or paralysed applicants.

Applications should be sent to:—
Awards Manager
C/- Box 87
Mitcham 3132
Victoria.

Membership of the EMDRC is open to all persons interested in radio. Visitors are welcome to attend meetings.

Fees: Full members $3.00 per year, 50 cents joining fee.
Junior members (under 18 years or attending secondary school) $1.00 per year, 25 cents joining fee.
Pensioners $1.00 per year, 25 cents joining fee.

Applications should be addressed to: The Secretary, EMDRC, C/- PO Box 87, Mitcham 3132, Victoria.

Geelong Amateur Radio-TV Club

On the second weekend in May over one hundred amateurs and their families attended the annual Geelong Hamfest staged by the club.

Aided by fine weather and many hours of preparatory work by club members, the program ran smoothly and everyone had a thoroughly enjoyable time.

Highlights were: The Saturday evening light entertainment session, which included a delightful and humorous appearance by a local entertainer and an enjoyable and interesting talk, by Phil Fitzherbert, spiced with anecdotes and superb colour slides of his Antarctic expedition.

Sunday saw the main activities, with many competitors in all the usual events. A scenic bus tour for the ladies was strategically scheduled to coincide with a monster disposal sale. Freed from the observant eye of wives, bidding was brisk for the more sought after items. However, bargains were the order of the day.

Club policy has always been to make the registration fee all inclusive and provide all meals at no extra cost. The ladies prepared and served the meals and, judging by the appetites and compliments, everyone enjoyed them.

Prizes were presented to the winners and place getters of the various events and competitions. The prize for the best home built gear went to John Lehmann, VK3TN, with consolation prize to Peter Mill, VK3ZPP.

The Annual General meeting was held on Friday 28th April 1972. The following office bearers were elected.

President	Mike Trickett	VK3ASQ
Vice-president	Alan Bradley	VK3LW
Secretary	Bob Wookey	VK3IC
Treasurer	Phil Fitzherbert	VK3PF
Technical Officer	Colin Lowne	VK3ZZS
Property Officer	Jim Goucher	—
Public Relations Officer	Terry Leith	VK3ZXY

Outgoing president Alan Bradley, VK3LW, in presenting his report, thanked all committee members for their support and hard work throughout the year. He outlined some achievements of the past year. These included the 1971 Hamfest, an open day in which amateur radio was presented to the public, commencement of a club project to construct an ATV transmitter, and participation in the national field day contest.

The field day effort is the highlight of the club's activity. For the last five years the club has fielded a team. Two certificates hang on the clubroom wall and members are quietly confident of another to be added soon.

The incoming president, Mike Trickett, VK3ASQ, expressed his intentions to do the job as well as Alan did, and to promote more activity amongst amateurs in the area.

WESTERN AUSTRALIA

29 DX Club

Members of the "29 DX Club" participated in the RSGB National Field Day over the weekend 3rd and 4th June 1972. A total of 119 stations were worked including 34 "G" NFD stations on the 14MHz and 21MHz bands. On 7MHz conditions were not so good and only one "G" portable station was worked, although contacts were made with JA; VS5; ZS5; 3D6; 9V1.

Operators who manned the club station VK611 were: VK6EU; VK6IZ; VK6NK; VK6PG and VK6RV. The equipment included a two element Quad antenna, with 150 watts input to a YAESU FTDX 400 transceiver.

ITU NEWS

On 29th May, the Administrative council of the ITU meeting for the 27th session, adopted by secret vote the following resolution presented by Algeria, Pakistan and Yugoslavia.

"The 27th session of the Administrative Council of the ITU, taking into account the United Nations General Assembly Resolution 2758 (XXVI) of 25th October 1971, decides to restore all its rights to the People's Republic of China in the ITU, recognizes the representatives of its government as the only legitimate representatives of China at the ITU".

This decision may have some benefits for the amateur. For a long time signals emanating from Radio Peking have been reported within the amateur band frequency allocations. Now as a member of ITU, adherence to frequency allocations in Region III should result.

AN EMERGENCY OPERATION

Newspapers, TV and radio reported on the disastrous floods which caused loss of life and serious damage to property in South Dakota, USA, in June.

Operators of amateur stations in the affected areas, assisted by net stations in other districts, provided an outstanding service to the community. Hundreds of messages were handled over a period of several days and operating procedures were of a very high order.

WIA YOUTH RADIO SCHEME

From Youth Radio Scheme examiner, Ken Hargreaves, VK2ZIL, the results for YRS Junior Certificates exams held in April and May were received. The successful candidates were:—

Yawarra Youth Radio Club:	
Wayne Buckpitt	Pass
St. George Amateur Radio Club:	
Bruce H. Cupitt	Honours
Nigel Cupitt	Honours
Neville J. Muir	Credit
Donald Sims	Honours

Rating for the various grades are 70% pass; 80% credit and 90% honours.

Westlakes Radio Club

This club operates as a co-operative venture dedicated to providing a meeting place for those who have a common interest; amateur radio. The club provides classes at all levels, from absolute beginners up to the Amateur Operators Certificate of Proficiency. Classes are held:

Sat	12 noon to 1.00pm	Intermediate standard
	2.00pm to 3.00pm	Elementary standard
	3.00pm to 4.00pm	Junior standard
Mon	6.15pm to 8.15pm	AOCP Theory
Wed	6.15pm to 8.15pm	AOCP Theory, Morse code and Regulations.

By arrangement with the Department of Education and the Hamilton Evening College, the AOCP classes are being held this year on two nights a week. Because of the connection with the College, the standard rates of $8.50 per term are charged. This entitles class members to participate in any other of the Hamilton Evening College courses free. Alternatively persons attending another evening college course may attend the radio course free. Pensioners may attend the course free.

More details of the club's activities may be obtained from the secretary, Eric Brockbank, Box 1, Post Office, Teralba 2284, NSW.

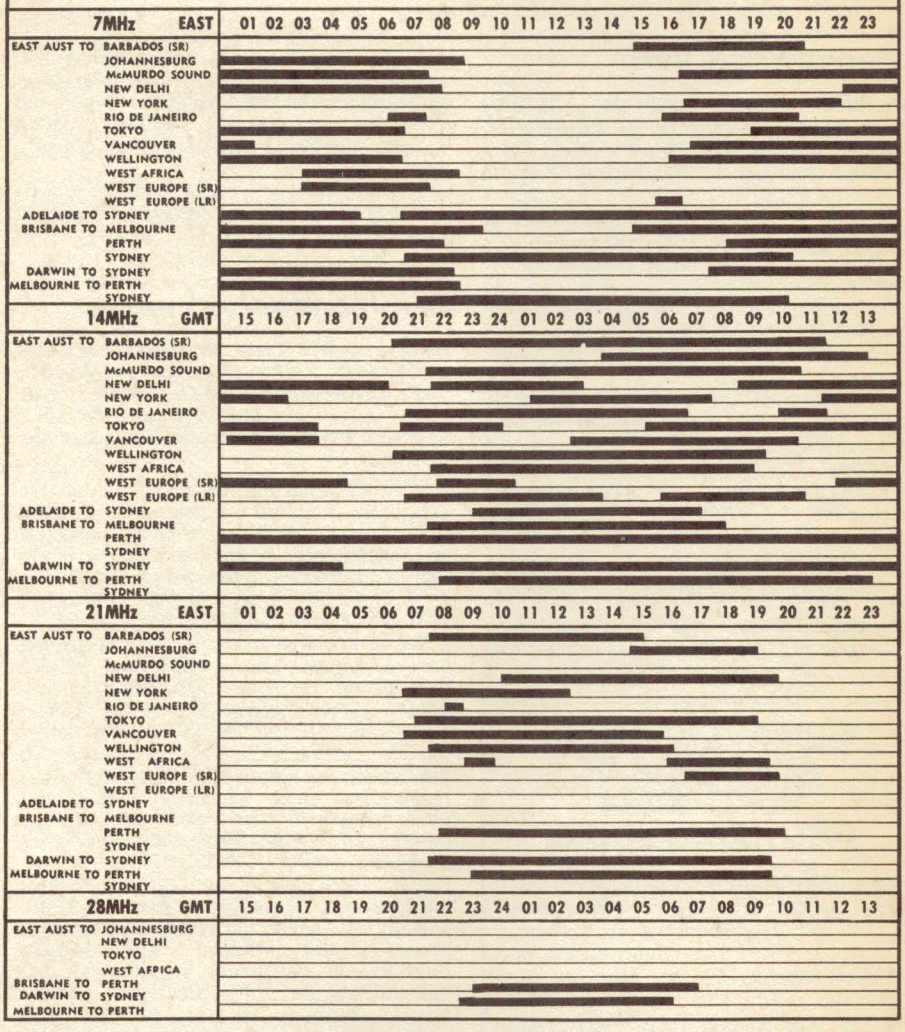
Maitland Radio Club

Already the Maitland Radio Club theatrette is proving to be of benefit to the community. The committee at a recent meeting decided to make the theatrette available to other clubs and organisations. The first group to use it was the Hunter Valley Gemology Club, who held a film night for members.

A stage production "All the World is a Stage" presented by Bill Aitken, a young Maitland actor who is making a name for himself both on stage and television, was staged for members during July. Mr Aitken said the theatrette was ideal for stage productions.

IONOSPHERIC PREDICTIONS FOR AUGUST

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Commonwealth Bureau of Meteorology. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). They have been prepared for the four most popular amateur bands over a number of interstate and international circuits. Black bands indicate periods when circuit is open. 8.72



The club has been forced to extend the YRS classes. In June a record number of 43 were attending classes on Friday nights. The additional class which started when the theatrette was completed had risen to 21. The attendance of classes now held on Tuesday, Friday and Saturday totals seventy.

Twenty-four members were scheduled to sit for YRS examinations on 1st July, 1972. The examinations will be another milestone for the club. It will be the first time club candidates have sat for the YRS senior radio certificate.

Other projects completed are a concrete floor for the new transmitting room, a base for a 50ft steel tower, and the foundations for a rock garden at the main entrance.

The Maitland Radio Club is in Tenambit Street, East Maitland, Full details from the secretary, telephone Maitland 33 7286 or write to PO Box 54, East Maitland 2323, NSW.

Scouts Radio Club

Scouts in the Mildura district have formed a Radio Club as part of the North-west Zone of the Victorian Division, WIA. The club was formed to interest the boys in communication and to extend the fellowship gained from the yearly Jamboree-on-the-Air.

A course of instruction has been undertaken to encourage the boys to obtain their own amateur licence. Brian Poulter, VK3RA and Mike Adams, VK3ZXB run the club, assisted by members of the North-west Zone.

The club station operates under the call sign VK3-BSM, using a Swan 350 transceiver. The boys hope to contact other Scout Club stations as well as making the usual enjoyable contacts with individual amateurs.

The station is on the air regularly each Monday night from 2000 hours to 2030 hours EAST on 3660KHz.

The clubrooms are situated at the Mildura Airport and visitors are welcome on any Monday night.

BOOKS & LITERATURE

Measuring CROs

MEASURING OSCILLOSCOPES, edited by J. F. Golding. Published by Iliffe-Butterworths, London, 1971. Hard covers, 145 x 220mm, 236pp, many illustrations. Price in Australia $13.90.

A book written to give a good working knowledge of the operation and applications of the modern measuring oscilloscope. It has been written by a group of design and development engineers at Marconi Instruments, but is intended for oscilloscope users and would-be users rather than for design engineers.

The scope of the book is deliberately restricted to real-time, general purpose instruments, to prevent it becoming too unweildy. The chapter headings show the presentation adopted: 1 — Construction and Operation; 2 — Getting the Signal to the Oscilloscope; 3 — The Y Co-ordinate (amplitude); 4 — The X Co-ordinate (Time); 5 — The Display; 6 — The Complete Instrument; 7 — Oscilloscope Applications. The book ends with a topic index.

Throughout the book the text is clear and concise. In the opinion of this reviewer, it achieves an unusually good balance between emphasis on theory and description of practice. For those seeking a sound and readable introduction to the modern measuring CRO, I would therefore warmly commend it.

The review copy came from the local office of the publisher, Butterworth and Co (Aust) Ltd. (J.R.)

Semiconductor course

SEMICONDUCTOR FUNDAMENTALS COURSE. Published by General Electric Co, Syracuse, NY, USA, undated. Soft covers, 8½in x 11in (215mm x 280mm), 446pp. Price in Australia, $8.50 plus 50c postage.

This is a programmed instruction course originally prepared for personnel involved in the marketing of General Electric semiconductors. It has been prepared to help answer such questions as: What is a semiconductor? — How does an SCR work? — How can semiconductors be put to work?

There are five sections, each covering several topics. The sections are: Basic theory and diodes — including semiconductor theory, conventional diodes and rectifiers, zener diodes, thyrectors, tunnel diodes, and back diodes; Transistors and fabrication techniques — NPN and PNP transistors, basic transistor theory and characteristics, fabrication of semiconductors, unijunction transistors; Thyristors — SCRs, SCSs, LASCRs, GTOs, Triacs, Diacs; Packages, mounting and failure mechanisms — packages (metal, plastic and glass), mountings (lead, stud, flange, pressfit and stacks), and failure mechanisms (electrical, mechanical and thermal abouse); Specifications — electrical symbols, major ratings and characteristics, and using the typical spec sheet.

This is a simple linear course, ideal not only for its original purpose of training salesmen, but also as a quick course for someone trying to get a basic backgrounu to the subject. The one serious criticism we would make concerns the omission of any mention of FETs.

The review copy was supplied by Australian General Electric Pty Ltd, 86-90 Bay Street, Ultimo, NSW 2007, from whom copies may be ordered. (J.H.)

DC amplifiers

DC AMPLIFIERS, by Bohumil Mirtes. Published by Butterworth and Co (Iliffe imprint), London, 1971. Hard covers, 155 x 215mm, 520pp, many diagrams. Price in Australia $14.40.

A book intended as a text for the undergraduate engineering student and as a reference for the practising engineer. It gives a thorough and intensive treatment of the modern DC amplifier — its operation, design and applications.

It is divided into three parts, each of two chapters. The first part covers fundamental concepts, dealing in turn with basic amplifier circuit elements (the thermionic valve, bipolar transistor and FET) and such general considerations as noise, drift, linearity, saturation, frequency response and stability. Part B then deals with basic directly coupled amplifiers, discussing first amplifier stages and then multi-stage configurations. Finally part C discusses the correction of gain variation and drift, using feedback, chopping and other techniques. The book ends with a list of some 122 references and a topic index.

It deals with its subject in considerable depth, using the mathematical models and techniques one expects to find in an engineering level text. The text is concise and would appear to be quite up-to-date. For those at university or tertiary college, or in a design situation seeking a good text on DC amplifiers, strongly commended.

The review copy came from Butterworth and Co (Aust) Ltd. (J. R.)

Printed wiring boards

GUIDE TO PRINTED CIRCUITS, by Gordon J. King. Published by Fountain Press Ltd, London, 1971. Hard covers, 145 x 225mm, 140pp, many illustrations. Price in UK £2.50.

This is essentially a practical handbook on printed wiring boards for the student and enthusiastic amateur. It covers not only such aspects as the development and design of boards in industry, but also practical matters such as making them at home, soldering and desoldering, and repairs. It also covers the available substitutes for custom printed boards, such as matrix board, "Veroboard", and specialised breadboard units. A final chapter discusses microcircuit techniques and various possibilities for the future.

As with many of the other books by well-known British technical author Gordon King, the text is concise and clearly written, and is well illustrated. It can therefore be commended to anyone seeking a sound guide to printed boards and their practical use.

The review copy came direct from the publisher. (J.R.)

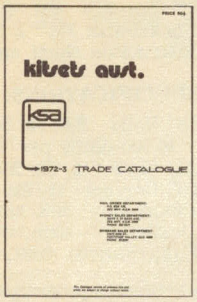
Digital logic ICs

HOW TO USE INTEGRATED CIRCUIT LOGIC ELEMENTS, by Jack W. Streater. Published by W. Foulsham & Co Ltd, Slough, Bucks, England, 1970. Hard covers, 5-5/8in x 8¾in (145mm x 220mm), 136pp, many illustrations & tables. Price in Australia $4.75.

This book has been written for the engineer or technician who has not previously used or designed digital logic circuits. It assumes only a basic understanding of elementary electronics and simple transistor circuits.

A good idea of the content of the book can be obtained from its chapter headings: 1 — Binary Numbers; 2 — Boolean Algebra; 3 — Gates; 4 — Gate Combinations; 5 — Bistable Elements and Their Use; 6 — How Logic Families Compare (covers RTL, DTL, TTL, ECL, CTL or CML, and MOS and

Kit-Sets' comprehensive trade catalogue



Illustrated alongside is the Kit-Sets Aust trade catalogue for 1972-73, mentioned briefly in these columns last month. Included are comprehensive list of components, kit sets, test equipment, tools, workshop fitments, and audio equipment for hi-fi installations, such as turntables, pickup cartridges, tuners, amplifiers, loudspeakers and headphones. Prices are quoted for each item, and purchasers are offered an up-dating service to keep the prices current. The catalogue is available for 50c, plus postage 25c from Kit-Sets Aust., PO Box 176, Dee Why, NSW 2099; or from the company's Brisbane branch, at 295 St Pauls Terrace, Fortitude Valley, Qld, 4006.

Kit-Sets has recently opened a new self-service components and hi-fi department at 230 Sussex Street, Sydney. This will be open during normal trading hours Monday to Friday, and on Saturday mornings from 8.30 to 12.00.

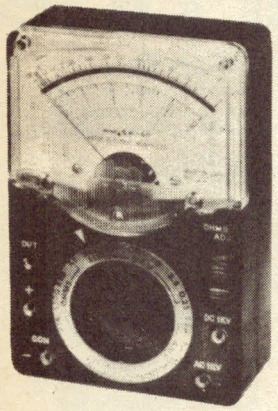
diode logics); 7 — Using Off-the-shelf Logic Elements. In addition there are two appendices: 1 — Decimal to Binary to Binary-Coded-Decimal (BCD) Table; 2 — Glossary.

In spite of its title, this book is slanted more towards how various digital circuits work rather than how to apply them. The last chapter gives some general hints on the construction of experimental circuits and on troubleshooting ICs. The majority of the text, however, is concerned with a reasonably thorough explanation of circuit operation. One small criticism: some of the complementary bars have been missed in the printing but these should be obvious if the reader understands what he is reading. A good introductory text.

The review copy was supplied by Grenville Publishing Co Pty Ltd. (J.H.)

NEW RH (Radio House) RANGE OF MULTIMETERS

MODEL RH-60 $29.00 Packing & Postage $1.00

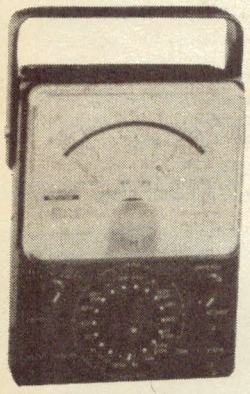


50,000 Ohms per Volt DC.
10,000 Ohms per Volt AC.
Specifications:
DC Volts: 0.25, 2.5, 10, 50, 250, 500, 1000.
AC Volts: 10, 50, 250, 500, 1000.
DC Current: 25uA, 5mA, 50mA, 500mA.
Resistance: 10K, 100K, 1M, 10M.
Decibels: —10 +62dB.
Accuracy: DC ±3 p.c., AC ±4 p.c. (of full scale).
Batteries: Two 1.5V dry cells. Overload protected.

MODEL RH-100 $39.75. Postage $1.00

100,000 Ohms per Volt DC 10,000 Ohms per Volt AC

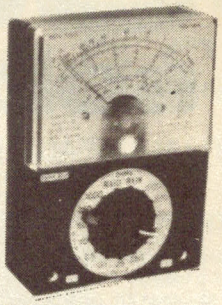
• Overload protected by dual silicon diodes • Double-jewelled ± 2 per cent meter • ± 1 per cent temperature-stabilised film resistors • Polarity changeover switch • Mirror scale • Instructions for operation with circuit diagram.



SPECIFICATIONS:
DC Volts: 0.6, 3, 12, 60, 300, 600, 1200 (100,000 / V).
AC Volts: 6, 30, 120, 300, 1200 (10,000 / V).
DC Current: 12A, 300A, 6mA, 60mA, 600mA, 12 amps. AC Current 12 amps.
Resistance: 20K, 200K, 2M, 20M.
Decibels: —20 to +17, 31, 43, 51, 63.
Accuracy: DC ±3 per cent. AC ± 4 per cent (of full scale).
Batteries: Two 1.5V dry cells, size AA, "Eveready" 915.

"HANDYMAN" RH150 $11.50

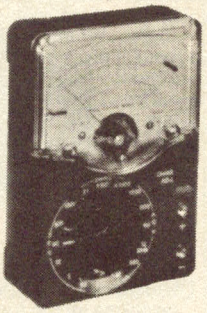
CHECKED PACKED & POSTED $12.00



Pocket-size 3¼" x 4½" x 1¼". Instruction sheet and circuit.

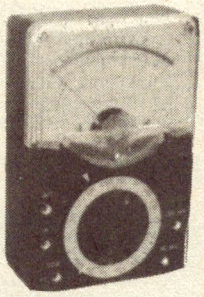
SPECIFICATIONS:
DC Volts: 2.5, 10, 50, 250, 1000. 10,000 ohms per volt
AC Volts: 10, 50, 250, 500, 1000.
DC Current: .1, 25, 250mA.
Resistance: 20K and 2M.
Decibels: —20db, +62dB, 0.7KHz.
Capacitance: .0001, .01, .0025, .25uF

MODEL RH-20 $15.00 Packing & Postage 75c



20,000 Ohms per Volt DC.
10,000 Ohms per Volt AC.
Specifications:
DC Volts: 0.25, 2.5, 10, 50, 250, 1000.
AC Volts: 10, 50, 250, 500, 1000.
DC Current, 50uA, 25mA, 250mA.
Resistance: 7K, 700K, 7M.
Decibels: —10, +22 (at AC / 10V) + 20, +36 (at AC / 50V). Upper frequency limit 7KHZ
Batteries: Two 1.5V dry cells.
With overload protection $18.00.

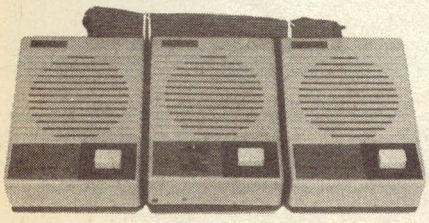
MODEL RH-80 $20.00 Packing & Postage 75c



20,000 Ohms per volt DC.
10,000 Ohms per volt AC.
Specifications:
DC Volts: 0.5, 2.5, 10, 50, 250, 500, 1000.
AC Volts: 10, 50, 250, 500, 1000.
DC Current: 50uA, 5mA, 50mA, 500mA.
Resistance: 5K, 50K, 500K, 5M.
Decibels: —10dB + 62dB.
Accuracy: DC 3pc.
AC 4 per cent (of full scale).
Batteries: Two 1.5V dry cells, size AA, "Eveready" 915.

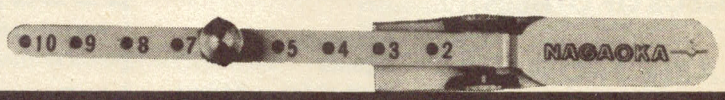
• Overload protected by dual silicon diodes • Double-jewelled ± 2 per cent meter • ±1 per cent temperature-stabilised film resistors • Mirror scale.

INTERCOMS



"Gem" 3-station $19.75
"Homer" 2-station $12.75
Postage 75c

STYLUS PRESSURE GAUGE, Balance type NW-501



$1.50 Posted

RADIO HOUSE PTY. LTD.

306-308 PITT STREET 61-3832 26-2817 760 GEORGE STREET SYDNEY. 211-0171

LISTENING AROUND THE WORLD

by Arthur Cushen, MBE

English non-stop from Brazil's International Service

Radio Nacional, Brazil, has commenced a new International Service from studios located in the country's capital city, Brasilia.

Radio Nacional was formerly located at Rio de Janeiro. Overseas reports have indicated that the station is now operating 24 hours a day in English, with the object of evaluating reception in Europe. The station is using 11720kHz with 75kW, and 15445kHz with 100kW. Transmissions are via a rhombic antenna, beamed to London but able to serve the entire Western European area.

Reception reports from listeners will be used to evaluate the effectiveness of the transmissions, and subsequently there will be programs in German, French and Italian for Europe, as well as Japanese and English for the USA. Spanish is also being considered.

Reception of a transmission in English from Radio Nacional on 11720kHz has been possible in New Zealand at 0130GMT. Before this time the frequency is also used by Berne, Switzerland, and from 0200GMT reception is difficult because of stations operating on the adjacent channels of 11715 and 11725kHz.

This English transmission is not the first we have verified from Brazil. From our verifications we find that PSB Rio de Janeiro was broadcasting English in 1941. Our verification states that "the transmissions are daily from 10220kHz and over the broadcasting networks of over 30 stations located in Brazil".

EXPANDED SERVICE FROM MONTREAL

In recent weeks, Radio Canada has carried out further test transmissions to Japan between 1000 and 1100GMT, using 9740 and 11725kHz. These tests are using new 250kW transmitters. Two of these are not in service, and three more are to be installed.

A tentative schedule for the period November 5 to March 3, shows that Radio Canada will be using their 250kW transmitters in place of the old 50kW units for almost all transmissions. Several new frequencies are scheduled, including 5960, 5980, 6040, 6085, 9635, 9650 and 11920kHz. The existing service to the South Pacific, which is daily 0825-0935GMT, is also to have 250kW transmitters.

FOUR ALL-NIGHT COLOMBIANS

Signals have been heard from four Colombian stations which operate on a 24-hours-a-day basis. Our reception of all four was around 0800GMT. La Voz de Bogata has been received at good strength on 5960kHz, and on 6065kHz the relatively new Radio Super is being heard. Radio el Sol at Cali is on 6140kHz. HJKJ, the longest established all-night service of the four, uses 6160kHz. All four stations have the usual Spanish and Latin American music programs, with frequent announcements and commercials in Spanish.

ANKARA RADIO

Some weeks ago we heard Ankara Meteorological Radio on 6900kHz at 0455 and again at 1900GMT. A verification letter has been received by airmail confirming our reception of this interesting station.

The letter, from Dr Umran C. Colasan, Director General of the Turkish State Meteorological Service, said "The Turkish State Meteorological Service employs two transmitters for the purpose of "The Voice of Meteorology' — short-wave 6890 and 6900kHz, both with a power of 2.5kW. The scheduled daily broadcasts are made on both frequencies simultaneously. One of the transmitters will be taken out of the service soon, since the experiment we have conducted on both transmitters with a view to better quality broadcasts is about to expire. Our broadcasts through "The Voice of Meteorology" will therefore, continue with one transmitter thereafter."

The antenna used is a delta-matched open-wire balanced 500-600 ohms system, 76ft long and 56ft high.

The schedule is 0455-0700, 1200-11615, 1800-1930GMT. The station opens with an interval signal, a melody performed on a saz, a Turkish instrument which sounds rather like a twangy mandolin.

INDONESIAN SIGNALS

Radio Australia says some interesting signals from Indonesia have been heard by Bob Bundy, of Truk, Caroline Islands. They are:

kHz

3905 RRI (Radio Republik Indonesia) at Djajapura, was heard to sign on at 0800GMT after the interval signal, in parallel with 6070kHz.

3916 RRI, at Terngate, had instrumental music, with identification in Indonesian at 1115GMT.

3985 RRI, at Merauke, heard with a news relay from Djajapura at 0900GMT, followed by local programming at 0915GMT.

4839 RRI, at Ambon, had an Indonesian program at 0906, in parallel with 7139kHz.

The editor of "World Radio and Television Handbook" advises that a list of low-powered local stations operating in Indonesia is now available for the first time for many years. These operate mainly in Djkarta and have a power restriction of 75 watts.

These stations operate mainly between 2300 and 0800GMT on medium-wave band, but some are on short-wave, in particular around 2325 to 2500kHz. Full details will be in the next "World Radio and TV Handbook", and the Danish Short-wave Club has obtained permission to publish the complete list with addresses in one of their bulletins.

RECENT VERIFICATIONS

COLOMBIA: Radio Super HJAX, Bogota, has confirmed reception on 6065kHz. Several of our readers have received a long letter in Spanish, which includes a list of the network stations affiliated with Radio Super, and a pennant. It appears that in May the station answered many reception reports sent to them when the station was first heard in 1971.

Radio Cinaruco HJLZ has confirmed reception of a report of 4865kHz sent by Chris Davis of Featherston, NZ. The verification came with a friendly letter signed by Garrid Munoz Tello Manager, and two post cards.

MALI: A verification card received recently from Radiodiffusion Nationale du Mali confirmed a reception report of October 1970. The station in recent months has been verifying reports, many of which were submitted 12 to 18 months ago. Our verification was for 7110kHz, and the power on this frequency is given as 50KW. Transmitters on 5995 and 9710kHz have 50KW and another on 4783kHz has 18KW.

NEW HEBRIDES: A verification card from Radio Vila on 3945kHz gives the information that planned operations on medium-wave will not be implemented before the end of the year. According to Mr John McNeil, Broadcasting Officer, the medium-wave service has suffered some setbacks, and no decision has yet been made about commencing date. Although they have an aerial, a lot of technical work still remains to be done, both on the transmitter and the studio.

NEW PRAGUE SCHEDULE

Radio Prague, Czechoslovakia, has introduced a new schedule, which includes a special transmission with 15 minute broadcasts in Czech, German, French and English. This service is 0630-1200GMT on 6055 and 9505kHz.

Broadcasts to North America, Australia and New Zealand have all undergone frequency changes:

GMT	kHz
0100	5930, 7345, 9540, 9630, 11990
0300	5930, 7345, 9540, 9630, 11990
0700	6140, 11855, 15310, 21690, 21700

The transmissions are of 55 minutes duration. The broadcast at 0700GMT is beamed to Europe, New Zealand, Australia, South East Asia and Africa.

ENGLISH FROM ETLF

A new schedule to hand from ETLF the Voice of the Gospel, at Addis Ababa, gives the frequencies and times of their broadcasts in English.

GMT	kHz
0400-0425	9730
1255-1325	15315
0530-0610	11890
1330-1345	15320
1330-1400	15400
1655-1710	6065
1755-1810	9705
1830-1910	7145
1930-2015	11955

ENGLISH FROM MOSCOW

English programs from Radio Moscow are relayed by the Siberian relay station on both medium- and short-wave for reception in Australia and New Zealand. The latest schedule received shows some frequency changes:

GMT	kHz
1100-1130	12060, 9750, 5960, 629
1130-1200	12060, 9750, 596, 1250, 629
1200-1230	12060, 9750
1230-1300	11940, 12060, 9750, 5960, 1250, 629

From September 2, 15130kHz (now used 1230-1300GMT) will be dropped. From September 3, 9540kHz will be used instead.

MADAGASCAR RELAY

The schedule of Radio Nederland relay station at Madagascar is being expanded in its service of rebroadcasting programs from Hilversum, Holland. The latest schedule includes some new frequencies:

GMT	KHz	Language
1400-1520	11785	English
1530-1650	11730	Dutch
1700-1820	9765	English
2130-2250	7295	English
2300-0020	7285	Indonesian
0030-0150	7285	English

Additional transmissions, formerly carried from Lopik in Holland, are:

1230-1350	21480	Dutch
1830-1950	15220	French
2000-2120	11730	Dutch

UNITED NATIONS RADIO

Broadcasts from United Nations Radio, New York, are relayed over Voice of America transmitters and are beamed to most parts of the World. On Saturdays are special transmissions to Oceania and Far East.

GMT	kHz
0230-0245	21460, 17850, 15365
	17830, 15155
0845-0900	11850, 5955
1000-1030	9565, 6185, 17860, 15250
1030-1100	9565, 6185, 15155

English broadcasts are at 0230 beamed to Singapore and Malaysia and at 0845 to Australia and New Zealand. At 1000 there is a ten-minute session for the Far East.

BROADCASTS FROM HANOI

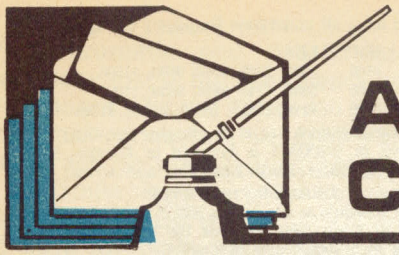
The present schedule of the Voice of Vietnam, Hanoi, has been supplied by Robert Crawford of Ingham, Qld.:

ENGLISH	
GMT	kHz
0630-0100	10040, 7038
0500-0530	10040, 12025
0830-0900	10040, 12025
1000-1030	10040, 12025
1200-1230	10040, 12025
1300-1330	15012, 12025
1530-1600	10040, 12025
2000-2030	15012, 12025
2300-2330	10040, 12025
FRENCH	
0400-0430	10040, 12025
1300-1400	10040, 12025
1630-1700	10040, 12025
1830-1900	15012, 12025
2030-2100	15012, 12025

BROADCAST BAND NEWS

TONGA: A new call-sign is now being used by the Nukualofa Station. This was formerly known as ZCO, but Tonga has been assigned a new prefix, and the station is now using the call A3Z. The station operates on 1020kHz and has the power of 10KW.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, New Zealand. All times are GMT. Add 8 hours for WAST, 10 hours for EAST, and 12 hours for NZ.



ANSWERS TO CORRESPONDENTS

RECEIVER FOR 52MHZ: Have you ever published, or are you considering publishing, a receiver to work with the 52MHz transmitter published in the "Reader Built It" section of May, 1971. (G.T., Kyabram, Vic.)

It is many years since we published a receiver specifically for the 50MHz amateur band. However, in March, 1963 we published the designs for 50MHz and 144MHz crystal locked converters (File No 2 / CV / 17) which could be used with a normal short-wave receiver. We also published designs for 52MHz handsets in May, 1970 (fixed frequency — File No 3 / TC / 5) and June, 1970 (tunable — File No 3 / TC / 6) from which you could possibly extract the receiver circuits for construction. Copies of the articles mentioned may be obtained through the Information Service for 50c each.

AMPLIFIER: Would you please send me the circuit diagram for a stereo amplifier, transistorised if possible. The input is from a turntable, and the output is for two speaker boxes. (W. J., Manly, NSW.)

Unfortunately, W.J. you have not given us quite enough information to help you. For instance, how much power do you need? What type is the pickup cartridge — a crystal, ceramic or magnetic? What impedance are your speakers? We need the answers to all of these questions before we can really help. In the meantime, did you see the low cost stereo amplifier in the January issue? This may be all you require.

ADDRESS WANTED: I have acquired an amplifier, turntable and loudspeaker which all have a metal tag with the name "Sound House", and an address. I wrote away to the address given for information but the letter was returned undelivered. Have you published details for a converter covering around the 3340KHz region? Recently I heard SSB signals on my receiver, and having another receiver on hand covering the same frequency, I heterodyned the signals together. I am wondering whether this would react into the aerial. Can you comment on this? (R.W., Sebastopol, Vic.)

The last address we have for Sound House Pty Ltd is that given in its advertisement in the May, 1972 issue — 14 Beatty Avenue, Armadale, Vic 3143. If mail is being returned from this address, we know of no other. A three-band converter covering the range you require was described in the May, 1966 issue. A project reprint of this can be obtained through the Information Service for 50c (File No 2 / CV / 20). We doubt whether your receiver will be radiating in the circumstances describe, but we are unable to comment beyond this as the information given is not sufficient for us to be able to determine exactly what might be happening.

BOOK: As I am a raw beginner in the field of electronics I would appreciate it if you could recommend a book or magazine which contains circuits of crystal sets and transistor receivers. (R.V. Lidcombe, NSW.)

If you require circuits of crystal sets and simple transistor receivers we can supply them from our files. In fact, an article entitled "Simple Crystal and Transistor Sets" was published in the July, 1969 issue. (File No 4 / TR1 / 11). If you need a book which explains the theory of operation of radio and electronics, we suggest our handbook "Basic Electronics". It is priced at $2.00, plus thirty cents postage

MORSE KEY: I have been reading your book "Basic Electronics" and intend to go for the amateur radio licence. Can you tell me where I can obtain a standard PMG Morse code key around Sydney, and how much it would cost? (P.F., Pennant Hills, NSW.)

This a bit out of our line, P.F., since we normally are concerned only with those components required for our projects. However, we are aware that Morse keys appear to be in short supply these days, particularly the type to which you refer. We have seen some British army types advertised by disposals stores in recent months, and this may be your best bet at the moment. We also suggest that you contact the Wireless Institute of Australia, who may be able to advise you if and where these are available.

100W+ GUITAR AMPS: Within these columns I have noticed requests from time to time for guitar amplifiers with power ratings in the 100 watts plus class. I have been waiting for such a design as have been many other readers, and I feel such a unit would have a very popular appeal to many. (R. B., Earlwood, NSW.)

The simple fact is that we have just not been able to get around to a very high-powered guitar amplifier, as yet. Without seeking to make excuses, we do wonder, however, how many guitar enthusiasts have been bemused by mere figures. One hundred watts is an impressive figure but if it happens to be fed into a loudspeaker system rated at 100 watts but, say, 3dB down in sensitivity, the final acoustic output would be the same as from a 50W amplifer and more sensitive loudspeaker.

PRICES WANTED: I find it irksome to chase through my rarely up-to-date price lists to determine the probable cost of parts for a particular project. In some cases the components are supplied in kit form and the cost is readily ascertained but in most cases I have to guess roughly or tediously search price lists. May I suggest that your writers include in their articles an estimate of the cost of construction at current prices?

I have been discussing with a friend the Autodim ("Electronics Australia", July, 1971) and he told me that a kit is available. Can you tell me the distributor and the cost?

One of my biggest problems in constructing your projects is in the manufacture of the case, chassis or cabinet, and I am loath to invest in unfamiliar metal working apparatus. At the same time, I am reluctant to continue with my present choice of either a casing salvaged from the scrap heap, or paying high prices for a commercially produced housing. Can you offer any constructive comments? Are you able to offer any information or opinion on the Heathkit series. Who is the local distributor? (W.H., Highate Hill, Qld.)

We avoid quoting prices because any figure would provide a source of contention with those who actually sell parts. Sets of components for most "Electronics Australia" projects are available from a number of our advertisers, and a study of the advertisements in each issue should reveal which companies are offering this service. Prices should be available on request. In the Brisbane area, Kit-sets Aust Pty Ltd maintains a branch, and should be able to assist you. Wherever possible we use standard case sizes for our projects to minimise cost. We see no alternative to buying the commercially made product, if you are not prepared or able to make one yourself.

"ELECTRONICS AUSTRALIA" INFORMATION SERVICES

As a service to readers "Electronics Australia" is able to offer: (1) Project reprints, metal work dyelines, photographs, printed wiring patterns and other filed material to do with constructional projects and (2) A strictly limited degree of assistance by mail or through the columns of the magazine. Details are set out below:

PROJECT REPRINTS: These cost 50c per project. Prior to December 1959, circuits and diagrams only are available. From December 1959 onwards, complete articles are available. No material can be supplied, additional to that already published. Reprints can be supplied more speedily if they are positively identified and not accompanied by technical queries. Material not on file can normally be supplied in photostat form at 30c per page.

SUBSCRIPTIONS, BINDERS, HANDBOOKS etc: These are handled by seperate departments. For fastest service, send separate orders to the departments concerned.

PHOTOGRAPHS, METAL WORK DRAWINGS: Original photographs are available for most projects. Price: $1 for 6in x 8in glossy print. Metal work dyelines are available for most projects. Price: $1 These show dimensions and positions of holes and cut-outs, but give no wiring details.

PRINTED WIRING PATTERNS: We can supply negative transparencies, actual size. Price: 50c. We do NOT deal in manufactured boards. These are available from advertisers

BACK NUMBERS: As available. On issues up to six months, face value. Seven months to 12 months, face value plus 5c. Thirteen months or older, face value plus 10c. Postage and packing, 10c per issue extra. Please indicate if a PROJECT REPRINT may be substituted if the complete issue is not available.

REPLIES BY POST: These are provided to assist readers encountering problems in the construction of our projects published within the last two years. Note, particularly, that we cannot provide lengthy answers, or undertake special research or modifications to basic designs. Charge: 50c. Inclusion of an additional fee does not entitle correspondents to special consideration.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee and may be answered in the magazine at the discretion of the Editor. Technical queries will not be answered by interview or telephone.

COMMERCIAL EQUIPMENT: "Electronics Australia" does not maintain a directory of commercial equipment, or circuit files of commercial or ex-disposals equipment etc. We are therefore not in a position to comment on any aspect of such equipment.

COMPONENTS: "Electronics Australia" does not deal in electronic components. Prices, specifications etc should be sought from appropriate advertisers or agents.

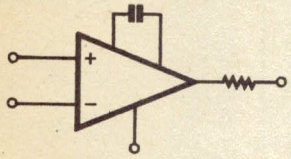
REMITTANCES: These must be negotiable in Australia. Where the exact charge may be in doubt, we recommend submitting an open cheque, endorsed with a suitable limitation.

POSTAGE & PACKING: All charges shown include postage and packing, unless otherwise specified

ADDRESS: All requests for data and information should be directed to the Assistant Editor, "Electronics Australia", Box 2728, GPO Sydney, NSW, 2001 — (10/71)

Heathkit products appear to have a good name. The present distributor for Heathkit is Schlumberger Instrumentation Aust (Pty) Ltd, PO Box 138, Kew 3101.

OVERLOAD PROTECTION: I was wondering if you have ever published plans for a device which will cut power to an amplifier when the speakers are disconnected. I have been led to believe that permanent damage will occur if the speakers are removed when the amplifier is turned on. Could you tell me if this is correct? Also, I have been puzzled by a symbol used for ICs. Could you tell me what is meant by the following symbol? (K. W., East Kew, Vic)



It is true that some amplifiers can be damaged if the load becomes disconnected while they are on. But this is generally due to excessive voltage swing, and it is not very easy to devise a protective circuit to disconnect the power in this type of situation. Some modern solid state amplifiers have inbuilt overload protection, like that used in our own "10-Plus-10 Stereo Amplifier" of April 1969, but this protects the circuit mainly against short-circuits across the output and against being grossly overdriven. You might be able to add this sort of protection to an existing amplifier, by studying the April 1969 circuit for guidance. The symbol which is worrying you is that generally used for an operational amplifier. To learn more about these, you could try reading the articles in the October and November 1971 issues.

SOLID-STATE TUNER: Have you ever published a design for a solid-state tuner with an RF stage for use on the broadcast band, or alternatively an RF amplifier (solid state) for the same purpose? Is it possible to add an RF stage to, or modify the aerial system of, a 27MHz citizens' band transceiver to increase its effective range? (D. M., Orbost, Vic.)

We assume that your requirement is for a tuner for DX reception. In this event, we cannot offer you anything suitable at present in solid state equipment. We did publish a design for a valve type equipment in 1966, but we have not so far published a solid state equivalent. However, we are working on such a design and hope to be able to publish a description in the reasonably near future. Concerning your second question, we would point out that there is no citizens' band in Australia, and the apparently widespread belief that 27MHz equipment can be used indiscriminately, without licence, is quite erroneous. All transmitting and transceiver equipment has to be type approved by the Postmaster-General's Department, and it would probably contravene regulations to modify such equipment without the consent of the PMG Radio Branch.

PEN FRIEND: Congratulations on a very fine magazine. I have been buying it since January, 1972, and find it very interesting and helpful. I am a young reader, 12 years old, and very interested in radio and electronics. Would you please publish my name and address as I am interested in finding a pen friend. I am building the three-transistor all-wave radio described in "Basic Electronics". (David Storos, 110 Dean Street, Enfield, NSW 2136.)

We are glad you find the magazine and our handbook of value to you in your hobby. We have published your name and address as requested — interested readers should write direct to David.

TIMING LIGHT: I wish to build a power timing light for setting ignition timing. I have been reading the article on the Stroboscope in the September 1971 issue. Is this unit suitable for triggering by the car's ignition system. There is a point marked "T / P See Text" on the circuit diagram. I cannot find any reference to it in the text. Would there be enough power available from the primary side of the ignition coil to trigger the unit if connected to this point? I imagine the EHT from the ignition coil would play havoc with the unit and could not be used. If this unit is not suitable could you publish one suitable for ignition timing. (J. M. Allawah, NSW).

The secondary of the ignition coil may or may not be suitable for use in a power ignition timing light, depending on the circuit and tube used. We published an ignition timing light in the August 1971 issue. This used a single neon tube, especially made for this purpose. A power ignition timing light was submitted to the "Reader Built It" section in the March 1971 issue. This unit did use the EHT to trigger it, via capacitive coupling. The point marked T / P in the September 1971 article is a test point, referred to in the first column of page 53. It is not intended for a triggering point.

NOTES & ERRATA

130 RECEIVER: (April 1972, File No 2 / SW / 62). Due to insufficient clearance around pin 6 of the IF transformer, there is a danger that it may be soldered or accidentally shorted to earth. Copper clearance may be increased simply with an oversize drill.

BEGINNERS' BOOK: I have read a few of your magazines and am very interested in electronics, but I do not know anything about the subject. Can you tell me where I can obtain a book for beginners. (J. C., Woronora River, NSW.)

Our own "Basic Electronics" handbook was written specifically as an introductory text for readers such as you. Copies are available through the Information Service for $2.30 including postage. We also review several books each month in our "Books and Literature" section: from time to time we include reviews of beginners' texts. In addition, of course, we have our "Elementary Electronics" section each month catering for beginners, and we often include other projects which beginners could attempt.

HIGH POWER AMPS: My young brother wishes me to build a 300 watt guitar amplifier. I am only an apprentice technician and do not have enough knowledge to design one. Do you have a 300 watt amplifier, suitable for bass guitar. It would need to have a frequency response of 100 to 10,000Hz which is about the range of the rhythm guitar. He wants extra jacks for other guitars and microphones, as well as a tape output. If you haven't got such a design could you put me in touch with someone who has. I would prefer valves to solid state. (T.D., Werris Creek, NSW)

We have never described a 300 watt amplifier. The highest power guitar amplifier we have described was the 60 watt Playmaster 117. This is a genuine 60 watts power — not "peak music" power which gives a greatly exaggerated specification. We have found that, with a reasonably efficient speaker system, 60 watts continuous is quite adequate for most requirements — in fact, for halls of only a modest size, it is too much power. Copies of the Playmaster 117 article (July 1967, File No. 1 / GA / 9) are available from the Information Service for 50 cents each.

STEREO AMP: I wish to make a 10 watt stereo amplifier using the Sinclair IC10 which was advertised in your magazine some time ago. It states in this ad that to use it as an audio amplifier all you need do is add such components as tone and volume controls. Could you send me the circuit of a simple amplifier using this IC, or could it be used in the stereo amplifier described in the Jan 72 issue. If so, what adjustments would be needed. (A.W., Blackwould, SA)

We do not know if the IC10 can be substituted in the Simple Stereo Amplifier, because we have not tried it. Furthermore, we have no circuits specifically designed for use with the IC10. We strongly suggest you adhere to the parts specified in the design, as we cannot offer any assistance if parts are substituted. You may have been mislead in thinking that substituting the IC10 would give you a 10 watt amplifier. The 10 watts quoted for the IC10 is a peak value. If brought to the same terms as the specifications for the SL403D, you will probably find that they both have the same order of power output — approximately 3 watts continuous into 8 ohms.

MOOG SYNTHESISER: You have a fine magazine. You have mentioned the Moog synthesiser at times, but have not given a full article on what it does and what it consists of. I am interested in trying to build one, and would like to know the approximate cost of assembling one, (M. C., Penrith, NSW)

We have had a number of requests for information on the Moog synthesiser, and more often than not, the enquirer has expressed the desire to construct one. Unfortunately this device is not a proposition for home construction except perhaps by very experienced builders.

ALL PRICES INCLUDE TAX AND POSTAGE

IMPORTED COMPONENTS

P.O. BOX 1683P, MELBOURNE 3001

SPECIALS

AC126	.85
AC187 / 188	2.00
AY1101	.28
AY1110	.99
AY1112	.51
AY1115	.46
BA100	.36
BC207	.59
BC209	.70
BF115	.78
EM402	.23
EM404	.26
EM406	.34
EM408	.42
OA90	.29
OA91	.30
OA95	.35
OA202	.60
ORP12	.75
SP1460	3.00
SE1001	.27
SE4002	.50
SE4010	.57
ST2	1.10
40669	3.10
2N3053	1.57
2N3055 (M.I.L. Spec)	1.60
2N3565	.42
2N3568	.67
2N3569	.71
2N3638	.57
2N3638A	.75
2N3642	.81
2N3644	.78
2N3645	.88
2N3693	.26
2N3819	.77
1N645	.84
1N914	.51
IN3491 + R	1.75
IN3492 + R	1.83
1N3493 + R	2.36
1N3660 + R	1.99
2N174	6.09
2N217	1.24
2N277	2.32
2N301	3.06
2N301A	4.23
2N406	1.01
2N417	1.77
2N441	1.80
2N443	3.22
2N456A	4.20
2N489B	14.76
2N591	2.61
2N649	2.12
2N696	1.13
2N697	2.34
2N706A	1.80
2N930	1.80
2N1038	3.92
2N1046	17.94
2N1073B	7.59
2N1302	1.01
2N1303	1.01
2N1305	1.13
2N1306	1.32
2N1307	1.32
2N1308	1.64
2N1309	1.64
2N1546	5.85
2N1639	1.39
2N1908	27.74
2N2102	3.17
2N2147	5.04
2N2160	2.40
2N2188	2.79
2N2270	2.40
2N2646	2.19
2N2647	3.15
2N2669	6.53
2N2926	2.25
2N3005	5.32
2N3054	1.80
2N3525	3.70
2N3563	.90
2N3564	1.08
2N3566	1.01
2N3567	1.08
2N3691	.86
2N3692	.90
2N3694	.90
2N3702	1.01
2N3703	.96
2N3704	1.77
2N3705	1.73
2N3706	1.65
2N3707	1.14
2N3708	.80
2N3716	5.30
2N3731	3.17
2N3790	11.25
2N4121	1.04
2N4250	1.17
2N4354	1.28
2N4355	1.65
2N4356	1.65
2SB186	1.50
2SB407	3.30
2SB474	3.30
2SF28	5.60
3N140	2.97
3N141	2.95
AA119	.36
AC107	2.28
AC125	.96
AC128	1.05
AC132	1.01
AC172	1.20
AD149	2.45
AD161 / 162	4.32
AN1102	.68
AN1103	.60
AN1104	.60
AN1105	.60
AN2001	.45
AN7102	.90
AN7105	.68
AS147	.80
AS148	.76
AS208	1.68
AS301	.91
AS306	.96
AS307	.96
AS308	.99
AS310	1.12
AS311	1.10
AS312	1.10
AS313	1.08
ASY73	1.66
ASY76	2.10
ASY77	1.80
AS216	3.03
AS217	2.59
AS218	2.91
AS220	.98
AS221	2.16
AT316	.68
AT318	.68
AT319	.69
AT322	.63
AT323	.68
AT324	.68
AT325	.83
AT331	.92
AT337	.69
AT338	.70
AT341	.70
AT350	1.14
AT1138	2.66
AX1101	1.53
AX1103	1.70
AX1104	1.86
AX1108	1.86
AX1127	1.50
AX1130	1.50
AX1131	1.77
AX1132	1.50
AX1142	1.20
AX1143	1.58
AX1144	1.44
AX1166	1.37
AX6168	1.98
AY1102	1.04
AY1108	1.65
AY1113	.69
AY1119	.60
AY6108	1.65
AY6109	1.65
AY8108(8103)	3.75
AY8109(8104)	3.00
AY8112	6.75
AY8135	5.40
BA102	1.46
BA114	.39
BC107	.83
BC108	.76
BC109	.91
BC147	.49
BC148	.45
BC149	.54
BC157	.52
BC158	.48
BC159	.57
BC177	.66
BC178	.61
BC179	.72
BC208	.63
BC212	1.50
BCY10	2.59
BCY11	3.24
BCY12	3.14
BCY39	5.19
BCY71	2.05
BCZ210	1.95
BCZ211	2.37
BCZ212	2.16
BD139	2.20
BD140	2.23
BDY20	2.63
BDY38+	2.62
BF145	.64
BF173	1.14
BF177	1.63
BF178	1.80
BF179	2.04
BF18	.72
BF185	.72
BF194	.67
BF200	1.32
BFY51	5.19
BSX19	2.16
BSX20	2.39
BT100A / 500R	3.00
BT101 / 500	5.40
BTY79 / 100R	2.70
BTY79 / 300R	3.45
BTY79 / 500R	5.19
BY127 / 800	.78
BYX21L / 200R	1.35
BYX38 / 300 + R	1.32
BYX38 / 600 + R	1.62
BYX38 / 900 + R	2.08
BYX38 / 1200 + R	3.03
BYX39 / 600 + R	3.14
BYX39 / 800 + R	3.88
BYX39 / 1000 + R	4.53
B2X70Scvies	1.35
B2Y88C303toC11	.65
B2Y88C12toC30	.82
BZY95 Scvies	2.16
BZY96 Scvies	2.16
BZZ15to29	1.95
C20D+	6.60
C106 / Y1	2.10
C122D	3.78
D13TI	1.95
DTG110B	6.96
DTG1010	15.16
EM410	1.40
FLV100	3.30
FPT100	1.80
H35	8.07
MB1	2.03
MB3	2.65
MB6	3.40
MB8	4.30
MJE2955	4.55
MJE3055	3.06
OA5	.65
OA10	.87
OA47	.65
OC20	6.38
OC22	3.03
OC23	3.80
OC24	3.45
OC44N	1.11
OC45N	1.11
OC74N	.96
OC141	2.60
OC201	3.80
OC202	3.70
OCP70	2.60
OCP71	4.32
ORP60	1.75
PA40	4.83
PB40	7.26
SC45D	11.10
SC50D	13.00
SE2001	.98
SE2002	1.20
SE3001	1.12
SE5001	2.10
SE5002	2.10
SE5003	2.48
SE5020	4.05
SE5023	3.15
SE5025	1.35
T1 / 40 / A2	3.30
T13027	2.61
TIC44	1.68
TIC45	1.88
TIC46	2.05
TIC47	2.30
TIP31A	2.10
TIP32A	2.70
TIP33A	2.98
TIS34	2.46
TIS43	2.36
40360	2.48
40361	2.70
40407	2.52
40408	2.98
40409	3.15
40410	3.30
40411	7.00

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MPF105	1.50
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uA710	1.65
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uA741	2.25
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TA50	35.00
TT797	1.60
TT798	1.60
40411	6.40
BC182L	150
TT800	1.95
TT801	1.95
3N81	6.40
TIL209(LED)	2.40
40362	3.10

SPECIAL QUANTITY DISCOUNT ON APPLICATION

AUDIO-MATE: How much does it cost to buy an instruction leaflet on how to build the utility amplifier-supply, the "Audio-Mate", described in your March, 1972 issue. Is this available in kit-form or would I have to get all the parts myself. Can you tell me the price both in kit-form and if I collect the parts. This will be my first project, so I will need as much information as possible to help me complete without too many mistakes. Have you any suggestions for a follow-up project? (V. N., Woodville South, SA.)

All the information necessary to build the Audio-Mate was given in the article. If you follow all the instructions carefully, you should be able to construct the unit successfully. We do not publish instruction leaflets, but if you require a copy of the article, we can supply a reprint for 50c through the Information Service. Kits of parts for this project should be available through several of our regular advertisers. We are not in a position to quote current prices for our projects — this information should be sought from advertisers. We regularly publish projects suitable for beginners, especially the regular series of articles appearing in the "Elementary Electronics" section.

HELP FROM AN AMATEUR: After raising money for some time, our club has recently raised enough to purchase a commercially built amateur band transceiver. However, we do not have a member with the required amateur license (several of our members hope to sit for the AOCP in August.) We would like to start operating as soon as possible, to gain experience. We write to your magazine in the hope that some amateur operator living near the Stanmore area may help us until we can operate on our own. (Stephan Teudt, Secretary, Newington College Youth Radio Club. Newington College, Stanmore, NSW.)

As you can see, we have published your letter and name in full. We hope that there is an amateur operator who will help you out. Best of luck with the club.

ECONOMY STEREO AND SPEAKERS: I have recently acquired two 15 ohm, 8 inch speakers which I would like to use in conjunction with the "Low Cost Stereo System" published in the Jan 1972 issue. Are there any alterations to the circuit to encompass these different impedance units? (D. T., Mt. Isa, Qld).

15 ohm speakers can be used with the Low Cost Stereo System, D.T., but you will only have half the power available, compared with that from the correct 8 ohm load. The only way you can achieve full power is either by using an auto transformer at each speaker to reflect the correct impedance, or to buy new speakers. You will probably find that the transformers will cost as much as new speakers.

ZENER PROBLEM: I wish to drop my car battery voltage from 12V to 6V to connect to a transistor radio. However, the load current of the radio varies with the gain, thus affecting the IR drop across a series resistance. A zener diode stabilisation circuit would seem to be the answer, but it leaves me two questions. What is the value of the series resistance? (Taking maximum load current as 250mA, it would be 24 ohms, but at any other current it would have to be greater.) What is the specification for the zener diode? (S.Y., Dulwich Hill, NSW.)

Your query is strictly outside the scope of the Information Service as it does not concern one of our projects. However because the answer to your problem may interest other readers, we are publishing it briefly as follows. The voltage across a zener remains more or less constant as the current flowing through it varies over quite a wide range. In the case of your particular problem, you should add 10-20mA minimum current through the zener to the maximum current drawn by your radio, ie 260-270mA total. This gives a value for your series resistor of 22 ohms. To determine the power rating of the zener, assume a maximum car battery voltage of about 14V. To drop this to 6V requires a current flow of 364mA through the 22-ohm resistor. Assuming the radio is switched off, all this current must flow through the zener which must therefore be capable of dissipating 2.2W. Similarly the resistor will dissipate nearly 3W. Incidentally, we published an article, Using Your Tape Recorder in a Car, in July, 1969. You may be able to get some tips from it. Copies of the article (File No. 3/MS/17) are available through the Information Service for 50c each.

AMATEUR TRANSMITTERS: I think "Electronics Australia" is an excellent magazine. I have successfully constructed many of your projects. As an amateur I should like to see many more projects of transmitters designed especially for the HF bands. I could not find any constructional articles at all for amateur band receivers over the past few years, and I think one or two would not go amiss. Nevertheless I thoroughly enjoy your magazine, and regard it as the best on the market in the fields it covers. (N.W., Ipswich, Qld.)

We are rather surprised at your statement that we have not published any receivers for the amateur bands. Last year we published a series of articles on the Deltahet Mk 2, which is a receiver of advanced design particularly suited to amateur use. We have other circuits of amateur equipment on file which can be obtained through the Information Service for 50c each. If you will tell us your requirements, we will see if we have anything suitable available. Many thanks for your comments about the magazine.

LEAKAGE CHECKER: I recently completed the Leakage Checker for Capacitors described in the Nov 1971 issue of EA. I found that it worked well on capacitors from .0068uF and upwards. It appears that it doesn't work on lower capacitance values. Is there something wrong? Checking the lower value units on an RC bridge proved them 100%. Will the checker test 160V and 200V capacitors? (B.H., Gayndah, Qld).

The Leakage Checker is essentially a high impedance power supply connected to an indicator circuit designed to register an unacceptable level of current. Any capacitor, when placed across the terminals in a discharged state, will cause a surge of charging current to flow. Large value capacitors will cause the surge to flow for a longer time than low value capacitors, and with very small values the initial surge will be too short to register. But the point to grasp is that with a good capacitor, the lamp will extinguish after a short while. 160V and 200v capacitors can be tested with the Checker, as the impedance of the supply offers non-destructive protection.

METAL DETECTORS: An explorers' club with which I am associated is interested in metal detectors for underwater location of sand and coral covered wreckage. Have any details of a suitable locator been published in your magazine? (J.H., Townsville, Qld.).

Details of a metal detector will be found in the January, 1970 issue entitled "A Different Metal Locator". Its indications are aural, and an additional visual circuit may be required for underwater work, apart from the necessary waterproofing of the electronics. The article is available from this office for 50c under File No 3/MS/20.

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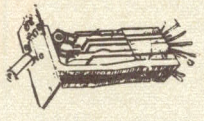

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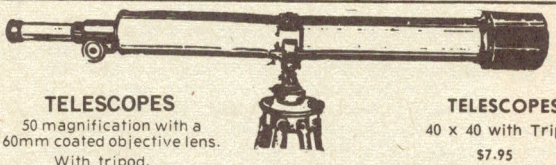

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With tripod.

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6C4	50c	VR65	50c
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P.M.G. 200 Ohms — 1,500 Ohm Coils. **$1.25** each. Post 24c.

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Brand new, 3 amp, 240 volt. S.P., S.T. **39c** each or 10 for **$3.**
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$35 value only $27.50
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Brand new, from well-known maker. Sorry, we cannot divulge brand name. 7" x 2,400' Mylar in plain carton.
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Types TR 1934 100-125 MHz and TR1935 125-150 MHz. 28 volt DC operated AM single crystal locks both TX and RX on same channel complete with generator. **$33.00**

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RECEIVERS ARC 49

100-165 M/CS **$25.00**

Deitch Bros.

70 OXFORD STREET, SYDNEY 2010

SORRY, NO C.O.D.

Serviceman . . . from P. 51

made. What next?

Fairly logically, voltage checks were made around the line output stage in an effort to locate a faulty component. This merely proved that there was nothing obviously wrong. Everything checked out as normal, and there was no sign of charred resistors or other evidence of faults.

Although the previous events have been narrated continuously, they occurred over a period of several evenings, in short sessions sandwiched between other matters which take up the time of a busy family man.

Mulling over the results obtained so far during the next 24 hours, my friend was drawn irresistibly to the conclusion that there were now only two possible places where the fault could be located, and neither of these was very pleasant to contemplate. They were the EHT transformer and the yoke. By sheer coincidence, he happened to be reading his copy of "Electronics Australia" that very day, and came across the project for constructing a shorted turns tester. The very thing for checking both of these components!

A check of the article indicated that most of the components would be on hand. The meter and coil were obtained that day from the local parts supplier, and that evening the device was assembled and working.

The device quickly proved its worth. The EHT transformer was given a clean bill of health, but the first checks on the yoke indicated that something was wrong. While a test from the centre tap lead to the end of one half of the winding seemed to indicate that all was well, a test from the centre tap to the end of the other half suggested a shorted turn.

The yoke was removed from the tube and a further check made. Again, there was a positive indication of a fault. To be doubly sure that the checks had been made across the right terminals, the back of the yoke was removed — and there it was. A badly charred lead. More precisely the plastic covered lead that joined the two windings and became the centre tap.

It was plain what had happened. The lead was hard up against a terminal. Probably the metal of the terminal had cut through the insulation. In any event, it had obviously become very hot. But why had the fault suddenly ceased to cause symptoms of overheating?

We could only speculate on this. Certainly, if the fault had persisted, and smoke had continued to pour out of the yoke, it would have been a much simpler task to locate and fix it. What probably happened is that the insulation charred sufficiently to provide a leakage path from the conductor to the lug. At the same time, it moved the bare conductor away from the terminal by expansion as it melted.

However, that was not all. When the damaged lead was removed and a new one was being fitted, it was realised that the fine winding wire lead from the nearby lug was broken. Once again, it is a matter of conjecture as to what had happened. The possibilities were that (a) the conductor had been burnt through when the overheating occurred originally, or (b) it had been parted during the repair on the burnt lead — perhaps the melting plastic had flowed around it, and the break had occurred when the lead was pulled out prior to replacement.

It was the work of a few moments only to effect a repair. And there was no doubt about the effectiveness of the measures taken. When the yoke was replaced and the set switched on, it was only a few moments before my friend was rewarded by program sound from the loudspeaker, and a few seconds later a picture appeared — albeit at a peculiar angle. Adjustment of the yoke and centring magnets soon produced a satisfactory result. Success at last.

The set has since continued to work extremely well — in fact its performance may be taken as something of a tribute to those who designed and made these early sets.

Converter . . . from P. 29

alignment.

The crystal oscillator should be adjusted first. Adjust the slug in the coil for maximum output as indicated on a dipper set up as a wavemeter at the frequency of the crystal. The slug is adjusted for maximum reading on the meter. The slug should be sealed in place with adhesive.

Alignment of the four signal tuned circuits is best done with a sweep generator and CRO. The prototype was aligned this way and we obtained a bandwidth just under 2MHz, with a spacing between the input coils of about 1/32in. The spacing between the pair of coils between the RF stage and the mixer was best at about ⅛in. This resulted in a dip in the middle of the response of about 3dB.

If sweep alignment facilities are not available, then the next best thing is to align against a signal generator, or from actual signals off the air. To do this, the converter is fed into a receiver covering from 5.5 to 7.5MHz, corresponding to 52 to 54MHz. Although this is a somewhat tedious process by comparison, with patience it is possible to align the converter quite satisfactorily. With alignment complete, each of the four slugs should be sealed in the same way as for the oscillator coil.

With the converter aligned, it now only has to be fitted into its case to complete the project. Ours is held in the case with screws and ⅜in brass spacers. So that the negative copper of the board may be insulated from the case, we used an insulating washer between each spacer and the board. The input and output coax sockets are wired in and the outer connection is directly to the case and a lead is taken from a lug under a mounting screw, to point 4 on the output and the equivalent point for the input.

Coil details

L1 11 turns 22 B&S enamel, tapped at 3 turns from bottom
L2 11 turns 22 B&S enamel
L3 10 turns 22 B&S enamel
L4 10 turns 22 B&S enamel, centre tapped
L5 11 turns 22 B&S enamel
All above coils wound directly on the grooves of Neosid 7.6mm slugs
T1 10 turns plus 10½ turns 32 B&S enamel trifilar wound on Neosid type 1050/1/F14, or Ducon type F684, Q2, balun core. Terminate as shown in diagram.

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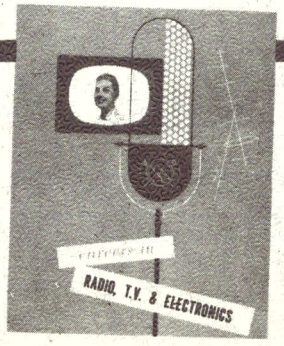

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